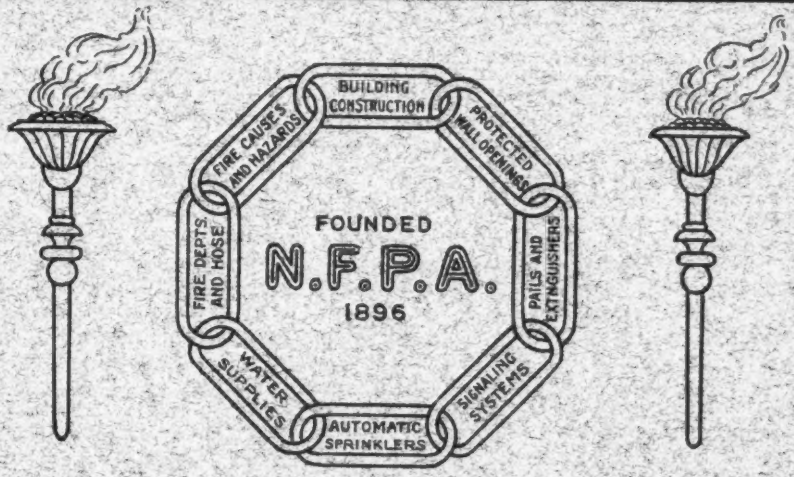
Vol. 2 JANUARY, 1909 No. 3

QUARTERLY
OF THE

NATIONAL FIRE PROTECTION ASSOCIATION



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OF THE

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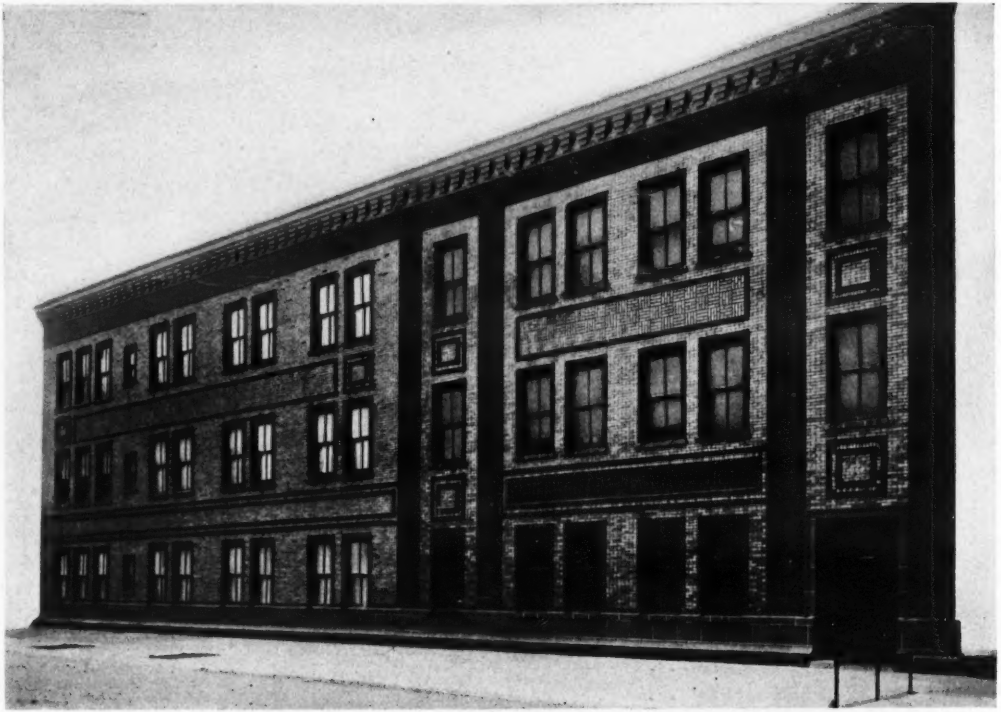


The New Plant of Underwriters' Laboratories.
Full description will appear in next issue.

Piano Factories.

The piano as we find it today represents the genius of hundreds of men extending over a period of many centuries, its mechanical development is intensely interesting and a brief summary is here given showing how from an extremely simple instrument of very limited capacity it has grown into one of mechanical perfection and wonderful possibilities.

The monochord is the first instance of a musical instrument where strings were made to vibrate on a supporting bridge over a sounding-board. It had but one string and various notes were produced by shifting one of the bridges. The dulcimer is one of the oldest predecessors of the piano and consisted of a box strung with wires that were hit with hammers, an ancient Assyrian bas-relief shows one in use, the psaltery is quite similar but in this case strings were plucked with a plectrum. Little improvement was made till the twelfth or thirteenth centuries, when keys were introduced, the exact time of their introduction is difficult to trace, but small organs which were played with keys were used in Germany in the thirteenth century. Organs had been used many centuries before this, but had been played with sliding rods or stops, only one sounding at a time. It is through the introduction of the keyboard that the forerunners of the piano and the piano itself came into existence. Following the psaltery came the spinet in which a quill or thorn was fastened to one end of a jack adjusted on a lever or key and set string vibrating by snapping it as it passed, when key was pushed up or down; there was but one wire for each key. The virginal was a modified form of the spinet and was in quite common use in sixteenth and seventeenth centuries. The clavicytherium was invented in Italy, about the fourteenth century. Strings were made of gut. The harpsichord was an enlarged form of the spinet and virginal, first appearing in Italy and being in quite general use towards end of sixteenth century. The strings were made of steel or brass wires and differences of forte and piano were produced by use of swell boxes, stops and sometimes a double row of keys, one with stiff quills the other with soft. There were from two to five strings for each note and by use of stops the additional strings could be coupled to fundamental note. In the clavichord an entirely new idea was introduced, the strings instead of being plucked were struck by small brass tangents at the ends of the keys which acted as both hammer and bridge. Brass tangent had to be held against wire long as sound was desired. It did not possess the power of the harpsichord but was the direct forerunner of the piano embodying the idea of the piano action.

Bartholomeo Cristofori of Florence, Italy, is called the inventor of the piano and is reported to have exhibited several in the year 1709. The action used in his piano was crude but it was he who adopted the idea of impelling a hammer head towards the wire, then allowing it to immediately rebound while the string continued to vibrate. No

Veneer Department.

damper was used. At first there was great difficulty experienced with the escapement. In latter part of the eighteenth century improvements were rapidly made in Germany, France, England and in America in the early part of the nineteenth century. As more and more power was demanded from the instrument the makers used heavier construction features until in 1825 the cast-iron plate was invented for square pianos. The method of "overstringing" wires was adopted after which improvement was chiefly in the individual ideas brought forth by the different manufacturers, many of whom soon sprang into existence until piano manufacturing became one of our great American industries.

PROCESSES.

All the parts assembled in a piano are not ordinarily made by the firm under whose name the instrument is sold: piano case, key, action or hammer making being each carried on as a distinct business and the work of many manufacturers is reduced to finishing the cases, setting up, assembling, adjusting the actions, tuning and voicing. The iron plates are almost invariably cast at foundries that make a specialty of this work and finish of same may or may not be done by piano manufacturers. It is only in the largest plants that we find the metal parts, such as pedals, casters, binders, special bolts and screws, being manufactured.

There is considerable variety in the method of progression employed by the various makers although in the main features it is necessarily very similar. We will not attempt to give the exact method employed by any one firm but at the same time try to give an accurate idea of how various parts are worked together to produce the finished piano. There is a great difference in the time allowed by the makers of cheap and the makers of high grade pianos, the former rushing work through rapidly as possible, while the latter allows six to twelve months for each instrument. Both grands and uprights are made by most large concerns and while the cases are very different in construction the rest of manufacture is practically the same.

Lumber Piles and Dry Kilns.

Wood is the first essential and all the large makers have their own lumber yards. Lumber must be air dried for at least a year (often two or more), after which it is put in dry kilns, temperature ranging from 110 to 170° F., and is left here from three to six weeks.

Mill Room.

Lumber is brought to this room where it is sawed and planed into the desired sizes, many parts are made of quarter sawed pieces, glued together, so there is considerable gluing done here, parts are piled on trucks and then taken to case making room.

Case Making.

Grands. The wooden portions of a grand are referred to in a general way as consisting of the case and trimmings. The **case** includes the rims with the supporting beams or braces within; the legs and pedals. The rim is made of continuous pieces of wood veneer (usually maple) from one-eighth to one-quarter inch thick, glued together; every grand piano has an outer and an inner rim each glued separately in forms and then the two are glued together. Outer rim varies in thickness from three-fourths to two inches, the inner from one and one-fourth to three inches; the number of thicknesses used varying according to the thickness of the rims and the thickness of the veneer. Inner rim is not so deep as outer, thereby forming a shelf around the entire inside on which rests the sounding-board and iron frame. The outside finishing veneer is applied at same time when forming is done. After forming, rims are piled in tiers and allowed to remain for several months before trimmed to proper size. Few people have any idea of the importance glue plays in the construction of a piano, practically everything is glued as there is then no chance for rattling or working loose of bolts or screws.

The supporting posts or braces are located inside the rim, being made of a single piece of wood or several pieces glued together and of varying sizes and shapes, but all arranged to securely support the rim and form the main body of the instrument. Great strength is necessary as posts receive the direct tension of the strings conveyed through bridge to sounding-board and prevent the iron plate from buckling. One of the best makers employs only two wood braces placed in "V" shape and uses in conjunction six heavy steel adjustable braces.

The **trimmings** include the top, fall board, music rack, key strip, key-blocks, etc., all made in the mill room and then veneered. The wrest plank or pin block into which tuning pins are to be set is next attached to case at front end. Its construction is of the greatest importance for if not well made piano will not remain in tune. It is composed of separate thicknesses of hard wood, usually rock maple glued one upon another, so that grain of each crosses at right angles the grain of layers directly above or below. Wood is carefully selected and seasoned and great care taken in the gluing and final finishing. It is usually trimmed to exact size in milling room ready to set in place in case room.

Uprights. In speaking of upright pianos, makers refer to the skeleton, the case and the trimmings.

In the upright there is no rim made of veneered wood and the **skeleton** is designed to perform the duty of posts and rim in the grand. It consists of uprights or standards, made either of a solid piece of wood or of glued-up pieces, and spaced varying distances apart, the better pianos having three to five good stout uprights, while a cheap piano would have perhaps a greater number but lighter and made of cheap cull lumber veneered over or painted to hide the many imperfections and knots. Filling blocks made of glued-up pieces are placed

between the uprights at top and bottom and after glue has set, the edges are trimmed to exact size.

The wrest plank, made in same manner as for grands but of different size and shape, is attached to front of skeleton at top being securely glued into place.

The **case** in an upright means the ends and the protruding sections (called "cheeks") that form the end of key-bed. These are made in milling room of solid or "blind" wood that is veneered; in a good piano the best quality ash, pine, whitewood or chestnut is employed for blind work, in a cheap piano any kind of common and cull lumber with all kinds of imperfections is used.

Trimmings, include top, front frame and panels, fall boards, lock rail, bottom frame, base rail, key-blocks, etc., (trusses may or may not be included in trimmings). All these parts except the trusses are made of blind wood that has been veneered.

Veneering.

Practically every piece of exposed wood used in a piano nowadays is double veneered on blind wood to withstand climatic changes of swelling and shrinking so that veneering becomes an important part of the manufacturing. All kinds of wood veneers are used although mahogany is the wood in greatest demand, walnut is also quite extensively used. Black or ebonized cases are made of plain hard mahogany stained with logwood. Veneers cut for the piano trade may be either sawed or shaved, the latter being thinner and about one-third the cost of the sawed veneer. In many factories an under veneer of whitewood is first applied, given about two weeks to dry, and then grain of outer veneer is applied so as to run across the inner grain, but the best factories use mahogany for under veneer.

Veneers are bought in large sheets of desired thicknesses and a large quantity will usually be found on hand, value being large and varying with quality of veneer used. The value of veneer varies from one cent per foot or even a fraction thereof to thirty and even fifty cents per foot.

First process is to cut, fit and match the pieces so as to obtain a handsome grain effect and insure as even a coloring as possible. Although almost impossible to detect in the finished piano, a great deal of piecing is done.

There are special cauls and presses for all the various parts of case and trimmings, in most cases both the metal or wood cauls; and the blind wood is heated in the caul boxes and in all cases the glue applied quickly before heat is lost, parts then are piled in presses, where very heavy pressure is obtained either by hydraulic presses or iron clamps. Forms must all fit closely in order to leave veneer perfectly flat and without blisters. After coming from presses they are piled in racks for several weeks in order to become thoroughly dry. The large tops of grands are put in heavy presses that have about forty upright screws, each requiring separate adjustment.

Sounding-Boards and Pinning Department.

Sandpapering.

Next process is sandpapering and while this is largely done by hand some manufacturers employ sanding machines for part of the work. A belt of sandpaper is often used or a sanding machine with three revolving cylinders of sandpaper (coarse, medium and fine), the piece being carried through machine by the operation of steel cylinders. At the time sandpapering is done small holes or checks are frequently discovered in the wood, which if left would cause blemishes. A special shellac is used to fill these up and when cleverly applied is said to escape notice. If decorating strips or scrolls are to be used they are glued onto panels and then finished off by hand carving.

Finishing.

Piano case finishing is practically identical with the finishing processes found in any high grade furniture factory but in the highest grade pianos is carried out to an even finer state of perfection. It comprises the following: staining, filling, varnishing, rubbing, flowing and final finishing.

Staining. The cases and trimmings come to staining room in the white and are here stained (by hand brushes) with aniline colors or potash mixed in water. The manufacturers of some of the cheapest grade pianos use an alcohol stain which does not penetrate into the wood, thereby eliminating sandpapering. After staining, parts are set in racks and left standing from twenty-four hours to three weeks before filling, according to the idea of manufacturer, and are then sandpapered by hand with fine paper.

Filling. This is next applied, a good liberal coat being given by hand brushes and the parts are set on racks to dry. The surplus filler is wiped off by either rags, coarse waste, excelsior or sea-grass and there is frequently a considerable quantity of any of these about filling benches. After filling, parts are left to dry atmospherically, the time varying from two days to three weeks.

Varnishing. All high grade piano makers give four or five coats of varnish to the entire case and an extra coat to the trimmings before the pumice-stone rubbing process. The length of time allowed for drying and setting between coats varies considerably, but is generally eight to ten days between first and second coats and four to eight days between second, third and fourth coats, this drying all done at ordinary temperatures, no heat used. In the cheaper grade of pianos where the idea is to hurry out the work soon as possible, they allow only from two to four days between coats and sometimes dry rooms are used to hurry this process, temperature being only slightly raised, about 80° F., also some quick drying varnishes are employed where after the first coat has been given the second, third and fourth can be applied every other day. In all piano factories the varnish rooms will be found filled with cases, partly or entirely set up and sets of trimmings on movable racks. Oily rags will always be found here and their disposition is of the greatest importance.

The manufacturer of a high grade piano wishes to obtain a very high and lasting polish, and to insure this never hurries the varnishing process, for if he does, one of the under coats is liable to shrink after final coat has been applied and this would bring disastrous results. Climatic conditions enter largely into this part of the manufacturing, therefore when weather is damp and muggy a longer time is necessary for the drying. Usually four weeks is allowed after last coat of varnish, before the rubbing is commenced.

Pumice-Stone Rubbing. The cases and trimmings are next taken to the rubbing room where each piece is carefully rubbed with ground pumice-stone, wet with water, a small piece of cork covered with felt is used for this work. Rubbing is mostly all done by hand although some makers use power machines for the large flat pieces such as tops of grands. Hand-work is far superior and naturally more expensive as it takes from two and one-half to three days to rub a large grand piano. After rubbing the parts are washed with sponge and water, then wiped off with chamois. Here again the time allowed before the next process, flowing, varies from about three days to three weeks.

Flowing. This is the term used to signify the final coat of varnish, this work being always done in a room that is carefully partitioned off and kept immaculately clean. In some factories the floors are oiled to keep down the dust, very small particles of which would be evident and prevent a perfect finish. It is said to be very difficult to find men who can do first-class work, perhaps not one in a hundred fairly good varnishers can do the flowing properly. Parts are given time to become thoroughly dry and then are ready for polishing.

Polishing. The term "polishing" is used in the piano trade to include, (1) The second pumice-stone rubbing which is given after flowing, (2) the rotten stone rubbing which is given to take out the pumice-stone scratches and prepares for (3) the hand rubbing. The latter process produces the final polish and is a very laborious piece of work; however, nothing has yet been discovered as a substitute for producing the high polish thus obtained. The men who do this work must take excellent care of their hands and are considerably troubled with atmospheric conditions, although hands must be soft, a great deal of strength is also necessary. This completes the finish of the piano case and trimmings except for the final cleaning that is given just before instrument is shipped.

Sounding-Board.

The sounding-board, also called the "belly", is decidedly the most important part of the piano and without the most careful construction a fine tone is impossible. The choice of the wood is of the greatest importance, it must be thoroughly dried (very often five years or longer allowed). The woods used are spruce or spruce pine, largely on account of their great elasticity, and the strongest possible grain is selected. Boards in the rough are about one-half inch thick. Edges

are first carefully glued together, the grain of wood being always arranged so as to run diagonally across board; then boards are planed, sandpapered and cut to desired size and shape. Thickness of finished board would be about one-quarter inch in the bass to three-eighths inch in treble. Boards are then dried for a month or more, usually in hanging racks at ceiling of sounding-board room, then put into the dry closet (temperature about 100° F.) from one to four weeks, after which the bars or ribs are glued onto back at right angles to grain of wood and immense pressure is obtained to hold them in place by the "go-bars" (second growth ash-bars about five feet long) that are sprung in between board, as it rests on bench and special plank brace near ceiling It is very important to obtain an arch on sounding-board, the bars on the back tend to cause this, also the boards and ribs are planed off towards the edges, and sometimes the bed-board rest on which go-bars are sprung into place is somewhat depressed to help form the arch. The wood has been thoroughly shrunk and will naturally swell in the presence of moisture, but the bars or ribs prevent swelling on the under side and the slight swelling on the upper side is desirable for the arch. After allowing time for properly setting, go-bars are removed and bridge (built up from several thicknesses of rock maple glued together) is glued on top of sounding-board.

This brings us to what is known as the "scale" and determining the scale is one of the difficult problems the manufacturer has to solve. The term scale is used to signify the relative lengths and sizes of the wires (which when struck produce the notes) and the size, shape and location of the bridge which supports them and through which their vibrations are conveyed to the sounding-board. An evenly balanced tone depends largely upon the determining of these points. Bridges are next blocked, i. e., marked and cut to pattern for location of pins, sandpapered, notched, pins driven, shellacked and varnished, after which they are set in place, line strips being previously set around edges of skeleton for board to rest on. In upright pianos some makers introduce additional strips of wood (made of glued-up pieces) and attach these across corners or sometimes around entire edge of sounding-board, purpose being to give a more balanced tone. It is perhaps more of a feature than an improvement, idea being to imitate the bent and glued-up rim of the grand piano.

The Iron Plate.

On top of the sounding-board rests the iron plate, set on line strips that run around edge of board and weighing from about one hundred and eighty to two hundred and twenty-five pounds for an upright to two hundred to four hundred pounds for a grand. It is made of cast-iron and must be carefully cast, as any weak spots would not be able to stand the enormous strain of the strings, which is anywhere from twenty to forty tons according to size of piano. Large holes left in plates are merely to reduce the weight. Every manufacturer uses a somewhat different style, in some cases the plate ex-

Stringing Department.

tends over the wrest plank (holes being provided for tuning pins) while in others it does not. The introduction of the iron plate is what makes possible the powerful tone obtainable, and, as previously stated, forerunners of the piano had no such plate and therefore strings could not be drawn to such great tension. Most makers have their iron plates cast all ready to set into place, casting and finishing them being a business in itself. Some of the larger makers have them cast in the rough and do the finishing themselves; also a very few makers do their own plate casting. Where latter is done the work includes casting, smoothing down and chipping, drilling holes, setting in bottom pins, japanning and finishing. The holes for tuning pins in wrest plank are carefully marked by patterns then plate is securely screwed into place, part of the supporting screws extending through holes in sounding-board to the wood skeleton. It must be very securely fastened or else will tear away when strings are strung up. Besides bearing the tension of the strings plate serves to hold the entire piano in perfect alignment.

Wires and Stringing.

The notes produced in a piano are caused by the hammer striking either a single wire or what is called a unison, i. e., two or three wires tuned to same pitch. The scale, as previously stated, is produced by using wires of varying lengths and varying sizes. In order to get the desired length for bass notes wires are "overstrung" on a separate bridge, higher than that used for other strings so that these bass wires can be actually strung crossing over top of part of the strings. Eighty-eight notes or seven and one-third octaves is the ordinary number employed, but on account of the unisons it requires about two hundred and thirty strings to produce them. Piano wire is the strongest known material for its size and is also used for deep sea soundings. The heavy bass notes are made of a heavy steel body wire around which one or two smaller wires (often copper) are wound, each of these double wound wires representing a single note; the next thirteen or fourteen are made of lighter body wire that is always single wound, two of the wound wires being used for each note or unison; the remaining ones are unwound wires with three for each note or unison.

In stringing, the hitch pins (drilled into iron plate) hold the wires in place, no adjusting is done at this end; at tuning end, wires are run through eyehole in tuning pin then are given a few preliminary turns before pin is driven into place. In order to hold wires securely in place where entering tuning pins they are either run through an agraffe or else over a rim on iron plate that is covered with a steel pressure bar.

Tuning pins are made of hard iron and are usually imported from Germany. Before actions are set in, strings are given a few preliminary "snappings" preparatory to tuning.

Hammers, Actions, Keys.

Hammer, action and key manufacturing are all carried on as distinct and separate branches of manufacturing and it is only in the factories of the largest piano makers that these parts are made. When these parts are bought ready for use the piano maker's work is reduced to trimming up and adjusting them.

Hammers. Hammer heads are made from a wedge-shaped piece of hardwood around which two layers of thick felt are glued, except that butt end is left uncovered. Both the wood and the felt are graduated in weight from heavy in the bass to light in the treble. The outer felt receives very hard usage and a high grade is necessary to stand the wear and also to produce the desired tone, for the hammer is a very important factor in the tone production. All the best felt comes from Germany and is very expensive. Special clamps are used into which an entire set of hammer heads is set and the strips of felt are glued onto them under very heavy pressure and after allowing time for glue to set, felt is cut to size of each hammer head. To insure it from pulling away a wire is run through the ends of felt and wood core and is securely clinched.

A round shank is glued into butt end of hammer head and other end of shank is glued into action. In setting up hammers, care is taken to see that each hammer strikes wire at such a point that unharmonious overtones will be deadened as much as possible, this point being at one-eighth the length of a large proportion of the strings.

The Action. The action includes the key and the intricate mechanism located between each key and each string or unison, which operates when key is depressed, forcing a hammer to strike that wire or unison, thus producing a note and immediately when pressure is removed from key forcing a damper against wires to prevent further vibration. The pedal can almost be considered part of the action, as one of its functions is to prevent these dampers from operating when player so desires, thus allowing the wires to continue vibrating and produce more tone or again, to shift action in such a way that it will not produce as much tone as normally. The action has a long hand service to perform and therefore should be strongly constructed at the same time capable of operating with the greatest ease and certainty. Grand and upright actions are quite different in design. In grands, the hammers strike the under sides of the wires, the latter being parallel to keys, and tone waves are thrown away from sounding-board; in the uprights, hammers strike tops of wires that are at right angles to keys and tone waves are thrown towards sounding-board.

The bass wires are heavy and long while the upper treble wires are light and short, but the player demands that the touch be as even as possible for all notes, so in order to obtain this result, leaden weights are imbedded in the wooden keys (under ivory covering), near the front of key to make operation easier and towards the back to make it more difficult. By the use of this method practically the same pressure can be used to produce each note.

Action making as found in piano factories includes light wood and metal working, mostly of a delicate nature and the attendant hazard is light.

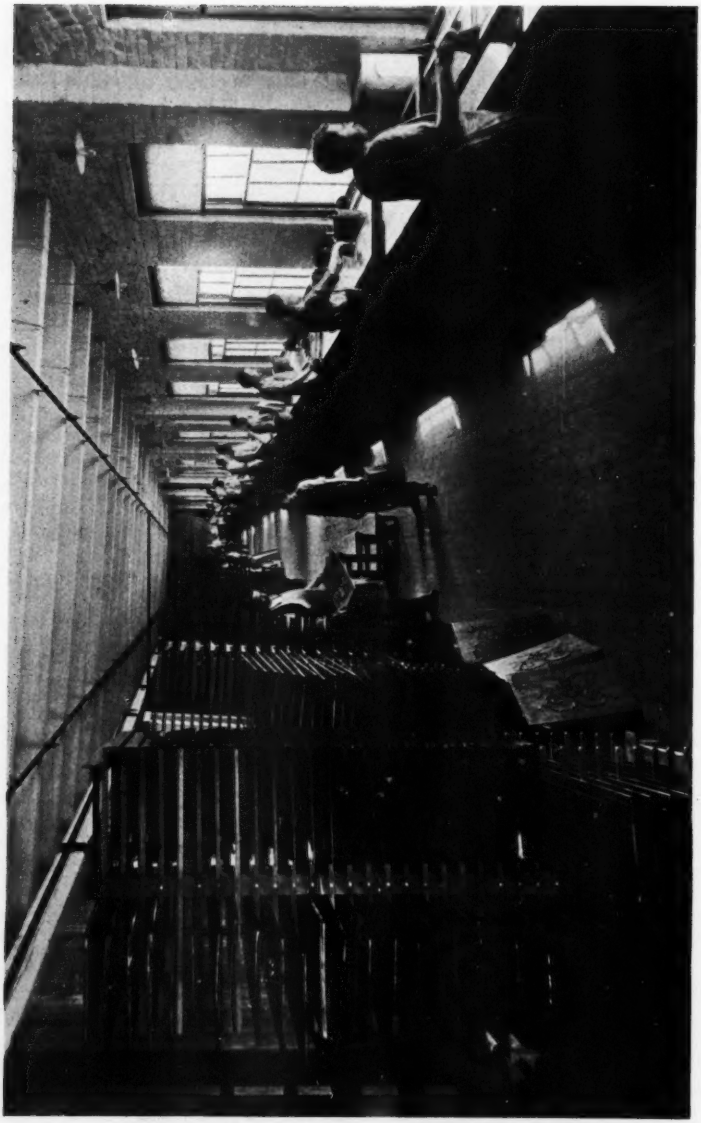
The woods used are chosen because of their special adaptability, and grain of each piece usually runs in direction of greatest strain, except that some parts are always made with grain running crosswise in order to avoid expansion and contraction in that direction.

There are many special machines used for cutting out and boring the small parts; the gluing of felt cushions, trimming, assembling and adjusting, all require skillful workmanship. The individual parts are all made the same length between centres so that entire set of actions can be mounted on supporting rails set into metal brackets, the latter supporting the actions in piano. When makers buy the actions ready for use they come set up in frames as just described. Hammers must always be set into actions separately when latter are being adjusted. During the action fitting, piano passes to a number of workmen each one of whom adjusts a special part.

Keyboards. As found in piano factories where keyboards are made the process is, first of all, that of light woodworking. The wood used is generally white pine; a board is made up of several pieces glued together (size about five to six feet long, two feet wide and one inch thick). In upright pianos the action frames as previously stated are held in place by four metal brackets secured to iron frame. Two of these brackets are located so that they approximately divide action frame into thirds, and when keys are cut, the concealed ends must be sloped off to avoid these brackets. When boards are first glued together, care is taken to see that grain of wood runs as nearly as possible with the slope designed for the keys. This slope is determined by the "scale" of the instrument which keyboard is to fit.

The ivory coverings for white keys are next glued on and then shaved off till absolutely smooth and even. The front edge of nearly all piano keys is now covered with celluloid, but in the high grade pianos the tops are always covered with ivory. As it is only in the case of a high grade manufacturer that the keyboards are made in the piano factory, the celluloid hazard (meaning by this the storage of sheet celluloid, cutting, cementing, and disposition of scrap) is practically eliminated from piano factory. This would not be true of a keyboard factory, for there a large number of celluloid covered keys would doubtless be made. An ivory key can easily be distinguished from a celluloid key, viz.: when made of ivory two pieces are required to cover each key, pieces being joined on a line with front edge of "sharps." For celluloid tops, only one piece is used, being sometimes merely "lined across" in imitation of the ivory piecing.

The holes for balance pins (which are set into balance rail to hold key in place at this point) and for front pins (which hold keys in exact position at front edge) are next bored and bushed with felt, then the keys are sawed out with a band or fret saw, edges planed and ivory coverings carefully finished on all corners, trimmed and polished. They are adjusted by careful balancing of each key, the leaden weights are let into keys at this time and felt pads provided at bottom of each



Varnish Department.

pin. Sharps are made separately, the best ones of ebony, although stained and japanned sharps are used in a great many pianos.

The Pedals.

The pedal action is simple, consisting merely of rods and levers, attached to the action frame, that operate when pedal is depressed to shift either all or part of the actions as desired.

The function of the pedals has already been referred to in its close connection with the action, a few words will explain the operation of pedals and difference between the grand and upright pedals. In the grand the right hand pedal (called either loud or forte) when depressed lifts the dampers off strings, holding them away and permitting each note to continue vibrating until foot is removed. The additional tone is produced by the sympathetic vibration induced in the strings not struck. These vibrations are always present in a piano but more apparent when dampers are off the wires. In the upright exactly the same operation is performed, although of course mechanical arrangement is different. In the grand the left hand or soft pedal shifts the entire action towards the right so that the hammers strike only two strings in the unisons of three, only one in the unisons of two and in the bass notes strike on the side of the hammer instead of in the centre. In an upright the soft pedal does not shift the action but brings the hammers nearer to the strings making less leverage and consequently a softer tone is produced. Middle pedal is designed to perform various uses and is frequently known as the tone sustaining pedal and allows one note to continue vibrating while dampers operate on all the others.

Tuning.

The number of tunings given and the length of time allowed between each varies with the grade of the piano, a high grade piano will be given a dozen or more separate tunings. The atmospheric conditions have a great deal to do with this, for in damp weather strings will not stay in tune. It is claimed that a grand will remain in tune longer than an upright, due largely to the fact that the strings of a grand being horizontal are all in the same strata of air, while in the upright where the strings are perpendicular they may be subject to very different degrees of heat and moisture. The preliminary tunings are frequently given by boys or men of little experience (especially in low class instruments), the final tunings must be done by experienced hands and ears.

Voicing.

After the tuning comes the very delicate operation of voicing and in this operation the beauty of tone can very often be either made or marred. Although it appears to be a most simple operation, the greatest skill is necessary to make the work a success. It simply consists of plucking the felt hammer heads with three fine steel needles

until the felt is rendered just soft and springy enough to produce the desired tone. It takes twelve to thirteen hours for the first voicing, after which the felt hammers are scraped off with sandpaper and then the second voicing requires five to six hours, being a repetition of the work previously done and renders the felt of the proper softness to produce a mellow tone when hammer strikes wires. One of the chief objects in this operation is to kill the unharmonic overtones and the picking of the felt causes the hammers to remain longer on the strings, thus dampening the harsh overtones.

Inspecting, Trimming, Final Cleaning.

The piano is now practically completed and is carefully inspected after which the trimmings are permanently set into place (having been previously fitted), then the case is gone over and given a cleaning with a little alcohol on a piece of chamois, then a little lemon oil perhaps thinned with turpentine.

The best manufacturers keep the finished pianos stored in the factory from six months to a year, often they are kept longer and are given several tunings during this time. Naturally a manufacturer who is rushing the work through as rapidly as possible will not trouble to do this. Careful, conscientious work from beginning to end is the only way to produce a high class instrument and the attention that is paid to every detail in a high grade piano factory is remarkable.

The careful work necessary on all parts of a piano doubtless has a great moral effect upon the men employed in this line of manufacturing and consequently educates them to exercise care in other ways which noticeably includes the prevention of fires.

Taken as a class the number of fires reported is not large and the losses paid are ordinarily not heavy even with the large values represented, this being particularly true with the properties equipped with sprinklers. Heavy water damage is possible, but this is somewhat offset by the fact that the great majority of fires reported start in sections necessarily separate from the finished piano storage sections and therefore not entailing as heavy a loss as might be expected.

SPECIAL HAZARDS.

Piano manufacturing presents few special hazards peculiar merely to this class of risk, but rather embraces the hazards of several well-known classes and the variety of hazards found depends entirely upon the completeness of the manufacturing, as carried on in each risk.

Dry Kilns.

These should be located as far as possible from main factory; in city risks it is often impossible to have kilns detached but they should be cut off in a standard manner and should be constructed either of brick or concrete. Construction of kiln is of the greatest importance, all wood sheathing and hollow wood finish should be avoided and if

area is large kiln should be divided into sections by fire walls. Canvas curtains are permissible at loading end of kiln. Construction of ventilators is also very important, they should preferably be of metal and located in roof. Kilns should be completely equipped with automatic sprinklers, and additional protection may be obtained from live steam jets. On account of the large amount of lumber in kilns distribution of sprinklers is considerably hampered, making use of steam jets in conjunction very desirable. Heating is either by steam or hot air. When steam heat is used pipes should be set on non-combustible foundations (ledges in brick walls are frequently employed); should be properly supported and so located that space below pipes may be easily cleaned out, pipes should not be so near together that they will form a trap to catch refuse. Where kiln is built of wood great care must be taken to see that steam pipes are well bushed where passing through woodwork.

When hot air is used fans should be located in non-combustible room adjoining kiln; steam coil and blower should be enclosed in sheet metal, with bearings located on outside of casing, fan room should receive special attention as regards cleanliness, care of oily waste, etc. Circulating ducts should be brick, provided with metal uptakes for each section of kiln. The method of returning air to fan for reheating is not to be encouraged on account of the additional hazard from dust and particles being drawn into fan.

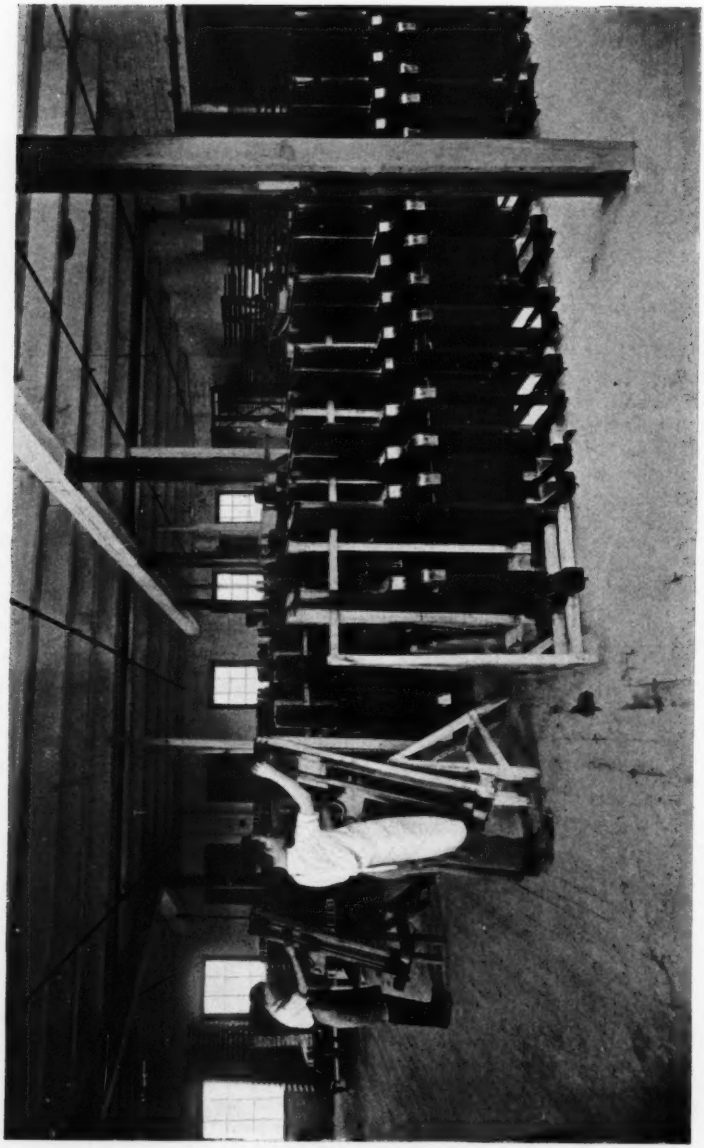
Automatic dampers should be provided in ducts and automatic device for shutting down fan. Best method of loading is by trucks which can be run in on tracks, although most ordinary method is by piling flat on strips or platforms which should be kept safe distance from steam pipes.

Kiln should be carefully watched and cleanliness insisted upon.

Mill Room.

In this room are found all the ordinary woodworking processes, such as sawing, planing, turning, shaping, boring, gluing, sandpapering. Mill room must be thoroughly equipped with a modern metal blower system of ample capacity, that discharges either direct to boilers or to a standard shavings vault.

Blower pipes should be as straight as possible and without obstructions; bearings at fan should be outside and self-oiling. Cyclone separator should be located on roof of boiler house or shaving vault and screen provided to prevent sparks entering same. It is a good plan to run fan a few minutes after mill room shuts down for purpose of cleaning out blower system. Besides equipping the various machines several floor exhausts should be installed for purpose of disposing of sawdust that is swept up. The sanding machines present the most serious hazard in this portion of factory and special attention should be given to design of blower pipes so that as much of the fine dust as possible may be collected by blower. There will usually be considerable fine dust that is not collected by blower; this should be removed twice a day. Refuse and trimmings must



Flowing Room.

be removed by hand and taken in trucks to boiler room where they should either be burned or else discharged into shavings vault; they should not be allowed to accumulate in front of boilers.

Glue Pots.

These are found in many parts of piano factory, being first encountered in mill room. The same rules apply wherever located. There are several very well arranged types in use, being generally either steam, hot water, gas or electric heated. Large kettles are designed to stand on metal legs one and one-half to two feet above floor, being provided with steam-jacket for heating. Where small pots are needed the table type of heater (water or steam) is often employed. Individual glue pots can then be removed and used where needed. Floor under large glue pots should be covered with sheet metal.

Numerous small glue pots are used at benches, steam pipes used to heat same should be kept well away from woodwork by bushing and supports. Where gas jets are used for heating bench pots, jets must be firmly secured and proper metal guards provided to protect flame. Heating by gas is much more dangerous than steam or hot water. Electric heated glue pots are seldom found in piano factories. This is usually an expensive though safe method of heating.

Shaving Vault.

Should be constructed of brick or concrete with non-combustible floors, light non-combustible roof that would readily yield to an explosion, and opening to boiler room (which should be small as possible) protected by a standard, self-closing, vertical, sliding fire door. A very good design has cement floor inclined towards doorway so that door need only be opened slightly when firing boiler. Doorway should be ten or twelve feet from furnace doors. Furnace feeder should be provided with hand and automatic dampers. Vault should be protected by automatic sprinklers and live steam jets with controlling valve in boiler room.

Waste and refuse chutes are often used for disposal of sweepings from various floors; they should be of brick and have openings at floors protected by substantial iron or tin covered doors kept closed when not in use, care being taken not to allow an accumulation of refuse on floor around door. They should discharge into a fire-proof bin or vault without openings into factory.

Caul Boxes.

These vary in size from small boxes (perhaps 12x18x26 inches) to large ones, being in fact good-sized closets. All should be lined with lock jointed tin, unless of non-combustible construction, and all but the very small ones equipped with sprinklers. Steam pipes are either at side or bottom and are frequently installed with no provision

for cleaning out around same, wood strips and stock frequently rest on steam pipes. All caul boxes should be frequently and regularly cleaned and heavy wire provided to keep wood away from steam pipes.

Skeleton and Case Making.

Hazards found here consist of gluing, caul boxes, sandpapering, disposal of refuse, all of which are referred to elsewhere.

Veneering.

Hazards here are from glue pots, caul boxes (sanding of veneers being hand-work). One other hazard is responsible for fires occasionally. When men are sanding veneered pieces any small cracks or bruises that are noticed are filled in with a special shellac which comes in sticks like sealing wax and small tools used for filling in wax are heated either over gas flame or small alcohol lamps. When former are used they should be stationary and encased in tin boxing. Small alcohol lamps should not be used, owing to the greater hazard.

Staining.

Water stains are used almost entirely and present no hazard, being composed of aniline colors and water. Spirit stains are occasionally used in the cheap grade piano. Stains are always applied by brush.

Filling.

Paste fillers are usually employed, some manufacturers prepare their own filler. It is composed of boiled linseed oil, silax, japan, aniline colors, and turpentine is used for thinning (sometimes benzine is used). Paste fillers are bought by the keg and thinned with linseed oil and turpentine in quantities as needed. Lampblack is frequently used to darken filler, it should be kept in metal barrel or box. Main supply of linseed oil, japan, turpentine, benzine, alcohol or other inflammable liquids should be kept in an oil house detached from main plant if possible, if not then built according to Specifications of the National Board of Fire Underwriters, for Inside Oil Rooms.

Only small quantities of these inflammable liquids should be kept in filling room, in tightly covered cans, and space around should be kept neat and clean. Benches where filling is done are often found deeply coated with filler. Frequent cleanings should be given to prevent this. Benches are often more or less covered with piles of loose excelsior, rags, cotton waste or sea-grass, which are used shortly after filling has been applied to wipe off surplus. As filler contains linseed oil and turpentine these are rendered very susceptible to spontaneous combustion and great care should be exercised in their disposition. Room is liable to be fairly warm, thereby increasing hazard. Employees should never be permitted to throw oily material on floor, under benches or into corners, standard metal waste cans should be provided in sufficient numbers and of ample capacity to take care of all such waste. In some factories a barrel of water is kept in room, rags being immediately immersed in same after using and barrel emptied daily. Too much care cannot be observed in looking

after the oily refuse and a careful inspection should be made by foreman of room before leaving at night.

Varnishing.

The varnishing hazard in a piano factory is much lighter than in the ordinary furniture factory, on account, 1st, of the high grade of varnish that is used, almost invariably turpentine and alcohol for solvents (a finely finished case is often the means of selling a piano and on this account manufacturer pays considerable attention to appearances, even in very low grade pianos), and 2nd, application is always by brush, eliminating the dip tank hazard. Only very small quantities of benzine or naphtha are used. Shellac is ordinarily used only for the unexposed and small parts, such as guides, pedal actions, damper rods, etc., and supply found is therefore small; shellac is also applied by brush.

The main supply of varnishes, oils, turpentine, alcohol, benzine, etc., should always be kept in detached oil house, thirty feet from main buildings where this is practical or in cut-off non-combustible oil house as previously suggested. A moderate supply of varnishes must always be kept in varnishing rooms, so they will be at proper working temperature, to obtain best results. The best method for handling and storing a barrel or more is to employ one of the patent air-tight storage tanks, provided with hand pump; this provides easy means of handling and also insures cleanliness. Many manufacturers buy their varnish almost entirely in five to twenty gallon tin cans, where this is done only a small supply need be carried in finishing rooms.

The disposition of oily rags must also be carefully attended to here and an ample supply of standard metal waste cans provided which shall be emptied daily.

The flowing process is always carried on in a separate room with a separate supply of varnish for use here. Quantity on hand should be kept as low as possible.

Piano manufacturers are well aware of the hazards existing in finishing department and low percentage of fires occurring here is due, no doubt, to the careful attention usually given.

Sounding-Board.

The sawing, gluing, planing, and sandpapering hazards all obtain in the earlier stages of sounding-board making. When brought to sounding-board room, boards are put into the hot closet, a small dry room fitted with light wood racks for supporting boards on edges, and remain here from one to six weeks, temperature of room varying in different factories from 100 to 130°. Room should be metal lined, and all woodwork kept away from steam pipes. As boards require such careful handling, this room is usually kept fairly clean. "Belly-bars" are heated in caul boxes and glue pots are in constant use here, both of the latter hazards previously referred to. Sounding-boards

are generally shellacked and varnished on one of the tables in sounding-board room. Careful workmanship is necessary and only small amounts of shellac and varnish will be found here.

Iron Plate.

In the large majority of factories there is no hazard connected with the iron plate as the completed plate is merely received, inspected, stored and secured in place. When they are manufactured (and this is very unusual) several additional hazards exist, i. e., ordinary foundry hazards. In the finishing process rust is removed by emery-stone rubbing and after drilling necessary holes plate is rubbed with alcohol (denatured or wood) or turpentine. These volatile substances must receive the same care already referred to. Boiled linseed oil, coloring matters, lead and varnishes are used for priming and finishing; hardening is done in brick ovens, steam heated to about 220°. Plates are either given a coat of bronze or japan, latter is applied by brush. No dipping hazard.

Machine Shop Hazard.

The machine shop hazards will only be found in the large establishments and where found include the ordinary metal working hazards such as casting, forging, oil storage, oily waste, japanning, lacquering, electroplating, buffing, and polishing, all of which should be arranged in manner described in previous articles.

LOUIS HARDING, *Inspector.*
The Underwriters' Bureau of New England.

Municipal Fire Departments.

OPERATION: FIRE METHODS.

FORE-WORD. Early in the year 1908, popular attention was directed to the New York City Fire Department primarily on account of the constant bursting of the so-called "rotten hose" when subject to ordinary usage and later on account of the spectacular fire accompanied by great loss of property as well as life in the "fire-proof" Parker Building which occurred on January 10, 1908.

An investigation of the fire department was promptly ordered by Mayor McClellan who designated the Honorable Commissioners of Accounts to be the investigators. The Commissioners of Accounts were experienced searchers for graft and mal-administration, but necessarily were not trained engineers. Their qualifications, therefore, did not fit them to appreciate the engineering defects which have long seemed to the writer to be the most essential weakness of the New York Fire Department in common with the fire departments of most other cities in this country.

After the investigation had proceeded for about three weeks, the Merchants' Association of New York City engaged the writer to co-operate with the Commissioners of Accounts in their investigation in order to supply the element of fire protection engineering which had been lacking up to that time. The writer was instructed to report on some ten or twelve features connected with the fire department, the most important of which was, in his opinion, the subject of "Fire Methods"—although unfortunately this branch did not appear to the Commissioners of Accounts as important as did several others. Nevertheless the officials of the fire department have already acted in conformity with several of the suggestions contained in the full report.

The following pages give the substance of the report on the single subject of "Fire Methods," much of which is applicable to fire departments in other American cities.

On account of lack of space many specific instances of mismanagement in the New York department and arguments favoring improvements which appeared in the full report have had to be omitted from this reprint.

INTRODUCTORY.

The primary object of the Fire Department is to prevent fires from spreading and to extinguish them with as little loss as possible. To attain this object, the best available means is the prompt and effective application of water in sufficient quantities.

To obtain sufficient water from an inadequate distribution system and throw it quickly and effectively upon any fire which may arise is an engineering problem which for its proper solution calls for a high degree of engineering skill.

This one problem involves the organization, equipment and operation of the Fire Department. In working out its solution certain rules and regulations have been established for the guidance of the department and certain fire methods have come into regular vogue. The handling of this problem is so vital to the practical efficiency of the Fire Department that every technical phase of the question should be fully and carefully studied.

WATER SUPPLY.

The work of the department is first of all dependent upon the character of the water supply. While the principal mains carry sufficient water for satisfactory fire service into some parts of Manhattan, yet the inadequate size of many minor distributors, and the inferior types of

hydrants used, combined with the low pressure normally maintained on the Manhattan low service, together result in preventing the fire engines from getting an adequate supply of water at many serious fires.

In regard to existing hydrants and their supplies, reliable tests were carried out in 1905, by the corps of able engineers employed by the National Board of Fire Underwriters. As a working basis for those tests it was assumed that six second size fire engines were to take water from six adjacent hydrants in groups throughout the city. An analysis of the tests showed conclusively that not more that 42 per cent. of the hydrants tested could be depended upon to furnish a fair to good supply for a second size engine, while five other second size engines were taking water from neighboring hydrants. That is to say, the tests showed that in a majority of cases at least one out of six second size engines attached to neighboring hydrants anywhere in Manhattan would be unable to obtain an adequate supply of water.

When the number of engines is increased to twenty or more with a considerable number of first size engines in the list, the inadequacy of the water distribution system becomes more startlingly apparent.

(To substantiate these statements Captain Curtis refers to the Report of the National Board of Fire Underwriters, 1905, and also gives personal observations of inadequate supply of water at several fires.)

SELECTION OF HYDRANTS.

The testimony already taken in the present investigation indicated that the proper location of engines at hydrants rested primarily upon the company officers and that the chief officers disclaimed any responsibility in the matter. In view of certain Special Orders which had been issued to the department, however, the responsibility should be shifted from the shoulders of company officers to those of the Chief of Department who is responsible for the orders. The Rules and Regulations of 1905 simply state that "on arriving at a fire, commanders of engine companies will immediately order a connection to be made to the hydrant, unless it appears to those having the longest distance to travel that their services will not be required, and report before stretching in."—Section 249. It will be observed that this section does not instruct company officers in regard to what hydrants should be selected.

(Attention is then called to orders issued at various times by Chief Croker to bring out the point that, previous to 1908, the orders simply took into account the location of engines as near the fire as possible while only recently have the orders covered the question of studying the hydrants and size of mains.)

The earlier Special Orders if strictly obeyed would almost surely result in cutting down the amount of water obtained by many of the engines more seriously even than has occurred in the past. This disastrous result is of course due to the inadequate distribution system. If the distribution system had been laid out along proper lines for furnishing an adequate supply of water at any point where it might be required, the instructions contained in the Special Order of July 1, 1904, March 16, 1905, and December 10, 1907, would be properly adapted to obtain the best results at any serious fire. But in view of the existing layout of the distribution system the above mentioned Special Orders cannot fail to result disastrously. The modifications of the earlier orders issued on February 19,

1908, while it should improve the situation somewhat, can still be further amended. Officers of companies reaching a fire on third or greater alarms cannot be expected to know which hydrants have already been taken by other companies, and as this knowledge is vital in selecting the best of the hydrants which are left, these officers are thereby forced to make a selection in partial ignorance of the situation. Under these circumstances it is to be expected that mistakes will continue to be made in the selection of hydrants inasmuch as late arriving companies will be apt to place their engines at certain hydrants without regard to the probable effect of such selection in cutting down the supply of water to engines already at work. A better method would be to place the responsibility for the proper location of the engines upon some individual officer; for example, either the chief in command or an aide designated by him who would make it his business to keep track of the hydrants already occupied by the engines and the sizes of mains in the immediate neighborhood.

In a general way, if there is any question of deficiency of water supply, late coming engines should be instructed to attach to hydrants on large mains sufficiently remote from the fire to avoid seriously reducing the supply of the engines already at work. To render the services of engines stationed at considerable distances fully effective calls for a change from the present practice in regard to stretching in lines of hose; and also requires additional equipment. The present practice appears to be based on the assumption that the water supply and the water distribution are both adequate, an assumption which threatens at any time to cause disastrous results.

The present defective conditions should be recognized and intelligent steps taken to meet them. A simple and obvious step towards making the proper selection of hydrants easier for companies responding to a fire would be to mark each hydrant conspicuously with the size of the main to which it is attached. This step, however, does not go far enough, for there are certain conditions under which a hydrant on a small main might be preferable to another hydrant on a considerably larger main. The proper marking of hydrants so as to indicate clearly those having sufficient water supply is a problem which should be left to trained engineers who are capable of appreciating all of the elements which enter the situation.

In some cases mistakes have been made through selecting hydrants too remote from a fire while the water supply in the vicinity of the fire is adequate.

ATTACHING TO HYDRANTS.

Size of Connection Used.

Section 171 of the Rules and Regulations of 1905 directs each engineer of steamer: "Upon reaching a hydrant in the vicinity of the fire, connect the suction or hydrant connection to the hydrant, then to engine; be sure the connections are air-tight. Companies reporting on extra alarms will always use the suction."

This provision apparently leaves it discretionary with the engineers of first alarm engines whether to use the small hydrant connections or the larger suctions. Experience proves that the use of small connections re-

duces the pressure of the water received from the hydrant materially more than does the use of large size suctions. In fact certain engines with which the writer is familiar are equipped by their builders exclusively with 4½-inch and 6-inch suctions instead of the 2½-inch and 4½-inch sizes carried by the New York engines. In view of the low pressure in the mains throughout a large part of Manhattan, a pressure which is still further reduced by the inferior types of hydrants now in service, it appears to be poor engineering to cut the pressure down still further by using hydrant connections of small diameter when larger connections are available. Of course it is recognized that promptness is an essential feature in handling fires. For this reason the use of small connections by the first engine company arriving at a fire might be justified, but all subsequent engine companies should be instructed to make use of the larger size suctions if there is any probability of the fire becoming serious.

What has been said in reference to the use of large and small size suctions applies also to the selection of 4½-inch hydrant outlets when available. The writer has noted the tendency to utilize the small 2½-inch hydrant outlets sometimes even when the large sized 4½-inch suctions are used.

OPERATION OF ENGINES.

Streams to be Furnished.

Section 156 of the Rules and Regulations prescribes that "the engineer of steamer will be held responsible for the condition and proper running of the engine, and shall furnish a good and sufficient stream of water when required; shall not cause or allow the destruction of tubes, coils, or boiler, or any other part of the machinery by lack of water in boiler, by freezing or any cause, and if any of the parts are out of order, or if anything is wanting, he will be held responsible until the same is reported to the commanding officer of the company."

It will be seen from the foregoing that the engineer of steamer is called upon to "furnish a good and sufficient stream of water when required." Nothing appears in the Rules and Regulations in regard to two streams, and yet it is generally understood that every engine suitable for use in a built-up community should be able to supply continuously two effective fire streams. Several engines in the New York department are of too small size to supply two streams. Many others of ample size have been found at tests to be in such poor condition or so poorly handled that they also were unable to pump enough water for two effective streams.

In cities where two streams per engine is the rule rather than the exception, a small number of engines is required to handle any given fire effectively, with the result that the average distance of the engines from the fire is materially lessened with corresponding increase in efficiency, while fewer engines are drawn away from the protection of other localities.

Although two lines of hose are sometimes seen attached to a single engine at serious fires in New York, yet this practice is decidedly the exception rather than the rule.

Of course, if an engine were attached to a hydrant on a main supplying insufficient water, the attempt to play two streams should not be en-

couraged; but if a suitable hydrant located on a main of ample size is selected, each engine of the two larger sizes might advantageously be called on to furnish two effective streams.

Speed of Engines at Work.

In filling two streams an engine must run at considerably higher speed than when playing but a single stream. Most engines of modern design when in good condition can maintain a speed approaching 300 revolutions per minute under service conditions. The writer has records of engines working at fires at speeds of 350 revolutions per minute and over. Such speeds are practically unheard of in the New York Fire Department. A speed of between 100 and 120 revolutions per minute is a frequent occurrence in New York, and the average speed of engines working at fires is apt to be in the neighborhood of 150 revolutions per minute.

Slip of Pumps.

The speed of the engine, however, is not always a sure guide to the amount of water the engine may be pumping. If some of the pump valves are defective or if other valves are left unclosed, the engine will suffer from what is known as a high percentage of slip, and a considerable proportion of the water which should be discharged at the nozzle will be wasted through the disordered valves. The question of slip becomes an important one when fully efficient service is required of the engine. For practical purposes "slip" is equivalent to "waste" and a high percentage of slip argues poor maintenance on the part of those responsible for the engine.

Although the question of slip is a very important one, in that it affords a direct indication as to the condition of an engine, the writer has been unable to learn that any systematic tests have been made by the department engineers to ascertain the slip and condition of the engines from time to time. Conversations with various engineers of steamers indicate that the latter are generally unaware of how the slip of an engine can be measured and what it indicates. The way some engines work at fires leads to the belief that excessive slip is present. Excessive slip may play a noticeable part in diminishing the effectiveness on a fire of a stream from any engine.

Size of Streams.

The capacity and power of similar engines in different cities is to some degree reflected by the sizes of streams which they are accustomed to play upon serious fires. In New York the writer is unable to recall any stream larger than 1½-inches played by a single engine. In other cities his records show frequent use of 1⅝-inch, 1¾-inch and 2-inch streams, each of them effectively supplied with water by a single engine.

In handling a serious fire an ample quantity of water is wanted in each stream, in combination with adequate stiffness in the stream. This desirable combination calls for competent handling on the part of engineers as well as good condition of the engines and adequate water supply. The reverse of all these conditions was illustrated at the Parker Building

fire in the streams from both the deck pipe and the tower nozzle of the water tower on Fourth Avenue, as well as by the siamesed stream when it was first directed against the Parker Building from the American Lithograph Building.

Steam Pressures.

Section 162 of the Rules and Regulations directs each engineer of steamer to "set the safety valve to lift at a pressure of 80 pounds per square inch, once in three months remove the valve from the chamber and clean off any corrosion that may have accumulated on the guide."

This rule is either worth preserving in the Rules and Regulations, or it is not. The writer believes that with the boilers kept in good condition there is no proper reason for the existence of such a rule, and he further believes that its existence on the books leads to its being regarded as a dead letter and thereby induces laxness in carrying out the other rules and regulations established for the guidance of the force. Personal observations have shown that this rule is frequently violated.

Water Pressure Maintained by Engines.

The following Rules and Regulations bear on the water pressure to be maintained by the engines while in service at fires:

> Section 173. "The relief valve in main pump will be set to lift at a pressure of 75 pounds per square inch, but in case this pressure is not sufficient for the work to be performed, such as forcing water through a long line of hose or pipe in an elevated position, or when the full power of the engine is required, the pressure will be increased by the order of the Commanding Officer, the churn valve and sprinkler will be closed and relief valve will be cut out, the pipeman will be notified of the fact, and if a controlling nozzle is on the pipe it will not be shut off until the order has been sent and pressure reduced on the line."
>
> Section 335. "The water pressure on a line of 3-inch hose, when the engine is working on the relief, shall not exceed 60 pounds. Should more pressure be required, the controlling nozzle on pipe will not be shut off until the pressure is again reduced on the line."
>
> Section 337. "When high pressures are required, the controlling nozzles will not be used on the line, as each company is supplied with different sizes of open nozzles, which must be used when the pressure on the line exceeds 60 pounds."

It is difficult to understand why a limit of 60 pounds is set when 3-inch hose is used. Three-inch hose is properly brought into play only when the friction of a 2½-inch line would cut down the effectiveness of its stream. In other words 3-inch hose should be employed primarily only when a long line is necessary or when a large quantity of water is to be discharged. Either of these conditions is almost sure to require a much higher water pressure at the engine than 60 pounds so that if the engineer attempted to abide by the 60 pound limit, the resulting stream would almost surely be unsatisfactory. The rule requiring open nozzles only to be used when the pressure is in excess of 60 pounds is presumably intended to save the hose from great pressures developed by suddenly closing the controlling nozzle. In other departments it has been found practicable to use controlling nozzles on any line even with the automatic relief and churn valve closed. This usage however requires some care and attention on the part of both the pipeman and the engineer. Where either the pipe-

man or the engineer is careless or incompetent either the relief valve or an open nozzle should be utilized.

In the last three months the writer has noticed several different engine companies making use of 3-inch hose. The average water pressures maintained by these engines was considerably over 150 pounds, the highest pressure observed being 245 pounds and the lowest 98 pounds.

ARRANGEMENT AND SELECTION OF HOSE.

Use of Large Size Hose.

Section 333 of the Rules and Regulations prescribes that:

"Companies equipped with 3-inch hose will use the same when called to fires on the second or greater alarms. Should the fire become extensive the first alarm companies, if equipped with a 2½-inch hose, will, in addition, stretch a line of 3-inch hose and substitute it for the 2½-inch line, or, if necessary, both lines may be used."

Section 334. "Companies equipped with 1½-inch hose will use it at fires when, in the judgment of the commanding officer, the fire will warrant its use; it will also be used in finishing up at fires, washing down, etc., relieving the large hose, which may be taken up or placed on tender or wagon."

Section 337. "Companies equipped with 3-inch hose will use this size hose on the entire line, when practicable, and with open nozzle . . . This size hose must also be connected to the 3-inch coupling on water tower when directed to connect the same. When working on roofs and fire escapes, the 2½-inch hose will be connected to 3-inch lines."

As previously stated, the object of using 3-inch hose is to lessen the waste of power and pressure which accompanies the use of 2½-inch hose. Where a long line of 2½-inch hose will, for example, absorb say 100 pounds of the pressure in friction the same length of 3-inch hose discharging the same amount of water will absorb approximately half that amount of pressure or say 50 pounds in the case above cited. As a rule, when an engine fills a line of 3-inch hose no other line is attached, so that the full power of the engine is available for a single stream. Under these conditions a large size nozzle is desirable to make use of a large amount of water. If the line is a long one, the loss of pressure by friction in the hose again becomes considerable, owing to the increased flow of water through the hose. To reduce the loss of pressure still further it is often advisable to add a second line and siamese the two lines into one near the scene of the fire. This procedure is in fact prescribed in the orders of some other fire departments.

Siamesed Lines of Hose.

The effect of siamesing two lines, particularly when the distance to be covered is considerable, is very marked in the reduced waste of power through friction and the lower pressure which the engine is obliged to maintain in order to discharge a satisfactory stream. Take the case, for example, of Engine 29 at the Joy Line pier fire on March 30, 1908. Assume that a powerful 1½-inch stream was required showing 50 pounds pressure at the nozzle. This calls for 470 gallons per minute—a quantity easily within the power of Engine 29 which is rated at 900 gallons per minute. (In fact an engine of the size of Engine 29 when adequately handled might properly be expected to play a 1¾-inch stream with a nozzle pressure considerably in excess of 50 pounds.) The engine was approxi-

mately 1050 feet from the fire and required twenty-one lengths of hose in its line. If the line consists exclusively of 2½-inch hose the pressure at the engine required to furnish a satisfactory 1½-inch stream will be in the neighborhood of 600 pounds. With a line of 3-inch hose the engine pressure would be reduced to about 300 pounds, while if a 2½-inch is siamesed with the 3-inch line into a 1½-inch nozzle the necessary pressure of the engine will be reduced approximately to 150 pounds. Thus an effective stream of large size from an engine remote from the fire is rendered possible through the use of two siamesed lines when a single line of 3-inch hose would leave such a stream outside the range of possibilities.

Increased Supply of Hose at Fires.

The methods suggested above of siamesing two lines to obtain a powerful stream of water would of course necessitate having an ample supply of hose brought to every fire. The lack of hose will in all probability be urged against this practice. In answer the writer would advocate providing adequate equipment to make use of the best methods even though the equipment called for may exceed what has been considered adequate in the past. In more than one progressive fire department, a reserve supply of hose is stowed on extra wagons ready to respond on second or greater alarms much in the same way that the fuel wagons are handled in the New York Department. In fact one fire department which carries at least 1,000 feet of hose on every hose wagon has a second supply of 1,000 feet of hose in every engine house in the business districts.

Superfluous Hose.

Inasmuch as every 50-foot length in a line of hose adds materially to the loss of pressure by friction and consequently requires the engine to maintain a higher water pressure in order to discharge an equally efficient stream, the practice of placing superfluous lengths of hose between an engine and the fire is to be severely criticised. Of course one or two or possibly three lengths of hose have to be pulled off the wagon at the scene of the fire in order that the nozzle may be carried wherever the circumstances may dictate. This necessary allowance of hose for shifting the nozzle, however, does not justify the many extra lengths which are to be found in one or more lines at almost every serious fire.

Superfluous lengths are particularly undesirable and inexcusable when connection is made to some stationary object such as a standpipe or a water tower.

SELECTION OF NOZZLES.

The Rules and Regulations include no definite instructions in regard to the proper size of nozzle to be used, though, as quoted above, Sections 335 and 337 specify that nozzles of the open type shall be used whenever high pressures are maintained at the engine or when 3-inch hose is used. Sections 352, 353 and 354 all call attention to the necessity of taking particular care of nozzles in order to avoid denting them.

Size of Nozzles.

The usual practice of the department appears to be to attach 1¼-inch nozzles to lines of 2½-inch hose and 1½-inch nozzles to lines of 3-inch hose. For general purposes this practice is to be approved. It is open, however, to two criticisms:

1st. If a second line is attached to an engine which is attempting to play a 1½-inch stream the chances are that both the first and the second streams will be so weakened as to become ineffective.

2nd. When a hot fire calls for the full power of an engine better execution can ordinarily be obtained by engines of the first size by means of 1¾-inch streams, than by 1½-inch streams.

To fill a 1¾-inch stream properly two lines should be run from the engine and siamesed near the nozzle.

Type of Nozzle.

In regard to the particular type of nozzle used, the writer believes that the Fire Department would do well to make comparative tests between streams from large nozzles attached to hose 3½ inches in diameter and streams from nozzles of the same size attached directly to 2½-inch or 3-inch hose. The knowledge gained by such tests would be of value under such conditions as existed during the Parker Building fire when the attempt was made to throw a stream across Fourth Avenue.

USE OF WATER TOWERS.

Number of Streams.

The practice in the New York Department when a water tower is operated at a fire is to utilize both the tower nozzle and the deck nozzle even though the fire may be at so great an elevation above the street that the stream from the deck nozzle is necessarily unable to do effective work. Two examples of this misuse of the deck pipe occurred at the Parker Building fire where the stream from the deck pipe of the water tower on 19th Street was aimed so sharply upward that it was of little or no value in reaching the fire. The stream from the deck pipe of the water tower in Fourth Avenue during the time that the writer observed it in operation not only failed to reach the stories in which the fire was burning, but by taking valuable water which might otherwise have been directed through the tower nozzle thereby deprived the stream from the latter nozzle of considerable water. The result was that for some time neither stream from this water tower was able to reach the part of the building where the fire was burning.

Connecting Pipes.

None of the water towers in service are provided with piping by which the deck pipe inlets can be connected with the tower inlets. Such connecting pipes are sometimes attached to water towers for the purpose of temporarily stiffening either the deck-pipe stream or the tower stream when necessary. By diverting part or all of the water from one nozzle to the

other, two weak streams can be combined into a single powerful stream. By doubling the amount of water discharged through either nozzle, the nozzle pressure can be increased fourfold, with a corresponding increase in stiffness. Under certain conditions, such as existed at times during the Parker Building fire, the ability to stiffen one stream at the expense of the other may be of considerable value, and it is recommended that the water towers now in service be equipped with gates and pipes to enable them to secure the advantage of this arrangement.

Number of Towers Employed.

It is unusual in New York to see more than one tower working at any fire at any given time. In fact the book of assignments to stations provides for the presence of only one water tower even on fourth or fifth alarms. In other cities the assignment books make provision for having additional water towers early on the scene in case their services may be needed. At a building as extensive as the Parker Building, running some 150 feet on 19th Street and 120 feet on Fourth Avenue, there appeared to be excellent opportunity for the use of certainly three water towers. Had the same amount of water been discharged through three water towers which was actually discharged through the two water towers and the two deck pipes, it is reasonable to believe that the effect on the fire during the early stages would have been much more marked.

Use of Water Tower with High Pressure Service.

When water towers are employed in conjunction with the new high pressure service it is probable that they will be called on to discharge greater quantities of water than hitherto. The reaction of the jet upon the nozzle will be more likely to cause the water towers to capsize—an accident which has occurred in various cities where greater quantities of water are played through water towers than is the case in New York. In anticipation of the new device it is advisable to make careful tests of the water towers in order to ascertain what pressure can safely be applied without danger of overturning them and also to ascertain whether the struts intended to prevent the tower from capsizing are entirely reliable on smooth and hard pavements. The practice in other departments is to attach guy lines to the upper part of each tower to increase the security against capsizing. The writer is of the opinion that this double provision for safety is advisable in New York also.

USE OF STANDPIPES.

Advantages and Disadvantages.

The practice of the department is to connect one or more lines of hose from an engine to a standpipe whenever such action appears to be advisable. Time is often saved by the use of standpipes as they obviate the necessity of raising lines of hose to the upper stories of high buildings. On the other hand, the use of standpipes has decided drawbacks, the most serious being that more streams may be fed from the standpipe than the

engine is able adequately to supply. Such a condition of affairs came under the notice of the writer at a fire in East 27th Street on May 25, 1907. An engine was connected to a standpipe in the Cornell Medical College from which three separate streams were supplied, and as a result none of the streams reached the fire effectively and the power of the engine and the efforts of the men were practically wasted. Similar conditions have been noted by the writer at other fires where unauthorized persons have attempted to handle additional lines supplied by a standpipe. To prevent the recurrence of this trouble the writer suggests that in all cases where a standpipe is utilized by the Fire Department, a company officer be made responsible for seeing that it is not taxed beyond the capacity of the engine by which it may be supplied.

Suggestion for a Portable Standpipe Company.

When lines of hose are needed in upper stories or over the roofs of buildings the usual practice is for each engine company to raise its own line to the required elevation by hand. If several lines are carried over the same roof this operation means the expenditure of considerable energy and a duplication of work. The writer presents for consideration the organization of a standpipe company whose duty it would be to place adequate lines of hose vertically in position whenever conditions call for them. The suggestion is to utilize some form of motor power in elevating several lines of large sized hose simultaneously into position. The writer is not aware that such a method is in use elsewhere, but he has been impressed by the frequency with which lines of hose have to be raised to considerable heights in handling fires in New York City, and with the desirability of raising these lines more expeditiously and effectively than at present.

USE OF AUTOMATIC SPRINKLERS, ETC.

Regulations and Practice.

Section 249 of the Rules and Regulations prescribes that:

> "Commanding officers upon arriving at fires in premises having automatic sprinkler equipments will at once report the fact to the officer in command thereof, and whenever practicable will order officers to make proper connections to said sprinklers for the purpose of more rapidly extinguishing fires, and a report of same will be made on the report of operations."

So far as the writer has been able to learn this rule has not been carried into effect in recent years. The reason given by the responsible officers for failing to attach lines from fire engines to sprinkler connections is that fires can usually be more effectively handled by means of engine streams than through sprinkler connections. Also as a rule the sprinklers are operating properly when the department arrives and additional water in the sprinklers is unnecessary.

It sometimes happens, however, that sprinklers do not operate properly owing to the supply tanks being empty, or accidentally gated off, or through some other disarrangement of the system. In such cases the prompt utilization of the sprinklers by the Fire Department might be of very great assistance in extinguishing the fire. Two cases of this descrip-

tion have recently occurred and on neither occasion did the Fire Department connect to the sprinkler system.

The first of these fires was in the building No. 191-193 Chrystie Street on December 3, 1907. Sprinklers of an inferior type were installed in this building and it is reported that owing to the poor pressure of the water supply available the sprinklers did not operate properly when the fire broke out. It is claimed that a higher pressure such as might have been obtained by connecting a fire engine to the sprinkler system would have caused the sprinklers to operate properly and have assisted materially in reducing the loss by fire. The damage occasioned by this fire to the building is reported to be $12,000 with considerably larger damage to the stock and merchandise contained in the building.

Another fire in a building equipped with sprinklers occurred on December 6, 1907, at the factory of the Carroll Box and Lumber Company, 627 East 18th Street. At this fire the sprinklers failed to operate, presumably because a gate in the supply pipe leading from the tank was closed at the time of the fire. The sprinkler system was provided with a suitable connection for fire department use, but this connection was not utilized by the department. Inasmuch as by means of the sprinkler system all of the water which an engine might pump through the sprinkler connection would be discharged directly upon the burning material, it is highly probable that the use of the system by the Fire Department would have been of material assistance in extinguishing the fire.

The claim is made by the Fire Department officers that the water was more effectively utilized in the streams which were played from the street and other neighboring locations. Such a claim is at least open to question. Fourteen engine companies responded to this fire and more engines could have been easily obtained by sounding an extra alarm. It would, therefore, have been entirely practicable to attach one or more of the engines to the sprinkler connection and still have enough engines left to furnish as many outside streams as the occasion called for.

It is to be regretted that no attempt was made by the Fire Department to utilize the sprinkler service in either of the two cases cited above; both because it is quite likely that by so doing the losses would have been reduced, and also because the use of sprinklers in these two cases would probably have furnished reliable information as to the benefit to be obtained by utilizing sprinkler connections at future fires.

Perforated Pipes.

The department makes use of perforated pipes with fair frequency and good success. Perforated pipes of course call for different treatment by the Fire Department from automatic sprinklers. Perforated pipes being always open can be brought into operation as a rule only when water is supplied to them by the Fire Department, whereas automatic sprinklers being at all times under water pressure operate instantly and automatically on the outbreak of a fire. There is therefore more need for the Fire Department to connect promptly to perforated pipes than to automatic sprinklers if the fire is in a position where it can be reached by either of these appliances.

Sprinkler Installations.

The ordinances prescribe that buildings over a certain height shall be equipped with standpipes, auxiliary fire apparatus *and such other appliances as may be required by the Fire Department.* Also that buildings used for business or manufacturing purposes shall be provided with perforated pipes along the ceiling of each floor below the first floor, or in lieu of such perforated pipes, automatic sprinklers may be put in. (Part 19, Section 102 of the Revised Ordinances.) Section 762 of the Charter, which remains effective until changed by the Board of Aldermen, gives the Fire Commissioner power to direct owners of factories, hotels, tenements, mercantile buildings, etc., to provide certain specified fire appliances as well as "other means of preventing and extinguishing fires as said Fire Commissioner may direct."

It is strongly recommended that the above authorization be interpreted by the Fire Department to include requirements for automatic sprinklers in all buildings which by their construction, occupancy or location might threaten to spread a growing conflagration to their neighbors. A requirement calling for the installation of automatic sprinklers, if adequately enforced, would add more to the security of the city against disastrous fires than any improvements which might be made in the equipment or personnel of the Fire Department.

While automatic sprinklers are not infallible, yet they have been proved by years of experience to be reliable in the vast majority of cases, and if they were provided with such a source of water supply as the new high pressure water system under a constant pressure of at least 100 pounds, their reliability would be considerably increased.

Comparing automatic sprinklers with perforated pipes, the former have so great advantages over the latter that it seems unreasonable to require the latter to be installed and not the former. Perforated pipes do not operate on fires until after the fire has been discovered, an alarm sent out and the Fire Department has reached the scene. Then an engine must be connected to a hydrant and a line of hose stretched to the proper pipe connection. Meanwhile the fire has continued to burn and spread, and quite likely has burned away the supports of the perforated pipe just in those places where its services are most needed. Automatic sprinklers, on the other hand, operate as soon as the heat from the incipient fire reaches them, and thereby as a rule prevent the fire from extending beyond the incipient stage. For this reason it is sometimes claimed that they are only valuable against incipient fires, without realizing that practically all fires pass through an incipient stage and that the sprinklers by acting promptly prevent the fires from reaching more serious conditions.

Another great advantage possessed by sprinklers over perforated pipes lies in the fact that the sprinklers operate only in the immediate vicinity of the fire while perforated pipes necessarily flood the entire area which they protect. Thus in a building 100 or 150 feet deep a single sprinkler might easily control a fire without doing any water damage to stock more than ten or fifteen feet away. On the other hand, a perforated pipe would flood the entire area from front to rear, and it is quite possible that the immense amount of water thereby wasted would leave insufficient water

to extinguish the fire if the latter happened to occur near the end of the pipe furthest from the source of supply.

It is therefore urged that automatic sprinklers be included among the appliances required by the Fire Department, and that the authority of the Fire Department to require such installation be extended to cover all buildings which may add to the fire hazard of their locality.

CHEMICAL ENGINES.

Lack of Chemical Apparatus in Manhattan.

The New York Fire Department occupies an almost unique position among progressive fire departments in that it makes no use of chemical apparatus within the city proper: that is, Manhattan.

Advantages of Chemical Apparatus.

The advantages of chemical apparatus may be briefly summarized as follows:

1. Promptness in getting into action.
2. Ease with which chemical lines may be handled.
3. Sufficiency for all incipient and many well started fires.
4. Independence from hydrant troubles, such as inadequate supply, frozen hydrants, or defective hydrants.
5. Availability as skirmishers on the outskirts of a threatening fire.
6. Reduction in water damage.
7. Well adapted to handle fires in confined spaces.
8. The use of chemical apparatus permits the heavy apparatus to be dismissed more promptly from fires.
9. Less likely to obstruct traffic on a busy street.
10. Chemical engines can be quickly moved from place to place to check simultaneous incipient fires.

In advocating the use of chemical apparatus in the New York Fire Departments the following opinions of able chiefs who have had long experience with such apparatus are presented.

(Then follow letters both new and old from several Fire Chiefs which substantiate the advantages given above.)

The arguments which were valid in the 80's while chemical engines were coming into favor, are equally valid at the present day. The writer has been present at numerous fires in New York where the services of chemical engines would have saved valuable time, damage and loss by water. On October 5, 1906, for example, the traffic on lower Broadway was held up for the better part of a half hour while a slight fire in a kitchen flue was being clumsily and inadequately handled by means of pails of water and other makeshift methods. A chemical engine would have extinguished the fire with neatness and dispatch in a couple of minutes.

The Fire Department carries lines of 1½-inch hose for attachment to larger lines and also has small size tips to screw on to the full size nozzles. Both these devices are intended for use at fires similar to those against which other cities would employ chemical engines. The writer has further observed several petty fires at which these minor appliances were not

in use, as the department apparently preferred to work with the full size streams, even though unnecessary water damage was caused thereby.

LADDER SERVICE.

In the use of ladders as vantage points from which to fight fires, the methods of the New York Fire Department differ noticeably from those employed in other large cities which have come under the writer's observation. Comparative statistics on such a subject are obviously impossible to present, but as a matter of simple observation the fact is obvious that where other cities make a practice of surrounding burning buildings closely with ladders on all sides the New York practice is more frequently to trust solely to water tower streams on the street front and possibly streams from fire escapes in the rear.

To provide adequate ladder service, however, particularly at elevations from fifty to seventy feet above the street and in locations difficult of access to the aerial trucks, additional equipment of portable extension ladders would be necessary. The writer has been told that instead of increasing the equipment of such ladders, the recent policy of the department has been to retire such few as were in the service. Pompier ladders have largely displaced the heavy portable extension ladders, even though the latter have many advantages which the light ladders lack. As regards availability at catastrophes such as the Windsor Hotel fire, for example, there can be no comparison between the secure footing for rescue work afforded by a substantial 60-foot or 65-foot extension ladder and the risky support of the frail 14-foot pompier ladder.

For taking a line of hose into an upper window a pompier ladder is obviously unsuited, while an extension ladder is well fitted for this use. The aerial ladder is of course also well adapted to this work, but the number of these aerials which can be conveniently stationed in front of any building is limited. To supplement the aerial ladders and to provide adequate ladder service in places inaccessible to aerials, the writer advocates an increased equipment of portable extension ladders from 50 feet to 65 feet in length.

MISCELLANEOUS APPLIANCES.

Smoke Helmets.

The department is at present fairly well equipped with what is known as Vajen-Bader smoke helmets. These appliances have rarely if ever been used at actual fires, and it is doubtful if they would afford satisfactory protection for more than a very brief time. The helmets are designed to fit closely enough over a fireman's shoulders to keep out the outside air or smoke. Each helmet is provided with a small tank containing compressed air which is discharged into the headpiece normally in the course of half an hour's use. A very brief computation will suffice to show the inadequacy of the apparatus. The tank is about 3½ inches in diameter and 8 inches long, and contains therefore somewhat less than eighty cubic inches of air. The maximum pressure in the tank is limited to 100 pounds, approximately seven times atmospheric pressure. Thus the maximum amount of air which the tank could discharge into the headpiece in the

course of thirty minutes is less than 600 cubic inches. It is said that for normal respiration about 300 cubic inches of air are required per minute and that when a man is vigorously employed the amount of air necessary is very much greater. If these figures are even approximately correct the supply of air carried in the tanks would suffice for only two or three minutes' work even if the discharge valve from the tanks were so designed as to liberate all the air contained therein ten times more rapidly than it is designed to operate. Under the circumstances the apprehension and distrust with which these appliances are regarded in this and other fire departments appear to be well founded. To make a helmet of this type practical the tank would have to be greatly enlarged and some modification of the valve be made so that a fireman could obtain fresh air as rapidly as he might need it. Some kind of an alarm would also be essential to notify the wearer a minute or two before the supply of fresh air was exhausted.

Another type of smoke helmet in which fresh air is supplied from outside sources is in service in the London and Paris Fire Brigades. In this type of helmet air is supplied through tubing in the same way as to a submarine diver, from bellows or some other form of pump. In its best shape the supply pipe acts as a speaking tube so that the fireman using the helmet remains always in communication with his associates outside. Whether such an equipment would be of practical use in the New York Department can be determined only by practical trials. The writer believes that the introduction of such an appliance is highly desirable, and that the device should be given frequent tests under service conditions.

Ladder Pipes.

Ladder pipes or nozzles mounted on the upper parts of extension ladders are employed by various departments as auxiliaries for water towers. Some of these ladder pipes are arranged to swing horizontally and vertically, and can be controlled from the ground as well as by a man mounted on the ladder. One of the advantages possessed by these ladder pipes over water towers is that they can be brought closer to a window or other opening than a water tower and from this closer distance can rake some parts of a burning building inaccessible to a water tower. There is no reason why such pipes should not be applied to the tips of 85-foot ladders and thereby become available against fires two or more stories above the limit reached by the present water towers.

Deluge Sets and Turret Nozzles.

The deluge set is an appliance by which two or more lines of hose can be siamesed and the resulting stream discharged effectively from a single large nozzle. The writer has had many opportunities to study the effects secured through the use of these appliances. The results demonstrate beyond question that these or similar appliances are of great value in handling fires which have obtained considerable headway.

Turret nozzles mounted on wagons are also of value in furnishing powerful streams. In the New York Department the wagons of the Engine Companies Nos. 58 and 60, stationed in Harlem and the Bronx,

respectively, are equipped with nozzles of this type. Opinions differ somewhat as to the relative merits of deluge sets and turret nozzles, but engineers are well agreed that an ample supply of one or both of these appliances is essential to the proper equipment of a city department.

Hose Couplings.

The use of 2½-inch couplings on 3-inch hose is recommended as being in keeping with sound engineering principles. In a large proportion of cases where 3-inch hose is used, a part of the line consists of 2½-inch hose which in the New York Department has to be connected to 3-inch hose by means of a special reducer. Special reducers are carried by every company equipped with 3-inch hose, but the use of reducers is always a possible source of confusion and delay. It is frequently necessary to replace a length of burst hose either 3-inch or 2½-inch and if the proper size of hose is not ready at hand, a reducer and an enlarger must be obtained in order to utilize a length of the other size.

There is a liability that the wrong size hose will be selected to piece out a line which needs to be extended and if the reducers do not happen to be readily at hand delay will result. A striking example of this difficulty came under the writer's observation at the Parker Building fire where he noticed several lengths of 3-inch hose cast aside on the upper floor of the Florence House evidently because the couplings would not connect with the 2½-inch standpipe outlet on the upper floor of that building.

The objection that reducing the size of the couplings materially increases resistance to the flow of water is not borne out by investigation. The matter has been studied by different authorities and all agree that the obstruction caused by a 2½-inch coupling in a line of 3-inch hose is so small as to be negligible for fire service. Couplings of the character suggested, namely, of proper size to attach to 3-inch hose and yet equipped with standard 2½-inch thread are practical appliances as shown by the fact that more than one progressive department is making use of them with good results.

SUGGESTIONS ON HIGH PRESSURE SERVICE.

Pressures on Hose.

Some apprehension has been expressed that ordinary hose will be unsuited for use with the high pressure service when the latter becomes available for fire duty. With siamesed lines of hose and nozzles properly adapted to the work in hand, there seems to be no reason why the hydrant pressure should often exceed 200 pounds, a figure now sometimes exceeded by fire engines. As even this pressure will involve difficulty in handling the lines it seems likely that lower pressure will become the rule for regular fire service. Excessive pressures appear to the writer to involve difficulties in handling, danger to the men at the pipe, and needless strain on the apparatus. The advantages to be gained by very high pressures are not obvious. The writer is of the opinion that with moderate pressures and with lines of hose kept reasonably short, standard fire department hose should prove entirely satisfactory. Of course this does not refer to

the inferior grades of hose purchased in recent years for the department, but to hose of standard brands having established reputations throughout the country.

Reducing Valves and Gauges.

In order to render the high pressure service properly available for every-day fire duty some provision will have to be made to permit the use of controlling nozzles on lines attached to the system. Some form of pressure reducing valve is the obvious solution for this difficulty. Such a valve to be effective should possess the following features:

Portability; to permit quick attachment to any hydrant outlet.

Ample water way; to secure an unobstructed flow of water whenever desired.

Adjustability; to maintain any desired pressure on the water in the hose.

Immediate relief on shutting off the line. It will be desirable to have the valve so designed as to limit the pressure on the line to say forty or fifty pounds the moment the flow is stopped at the nozzle.

Pressure Gauge. Each valve should be equipped with a double gauge showing the pressure both on the hydrant and on the line side of the valve.

Durability.

The features mentioned in this list will be necessary to give the proposed service the flexibility and adaptability now obtained through the aid of fire engines. Without some such device as that proposed above the system is in danger of becoming so unwieldy and difficult to handle that the firemen will be inclined to oppose its general adoption and thereby prevent the full development and utilization of an extremely valuable means of safeguarding the city.

To get the best results out of the new system its use by the firemen must be made as easy and as satisfactory as possible, for this reason high pressures are to be deprecated unless absolutely necessary and the employment of reducing valves such as those described above is to be urgently advocated. The question of success or failure of this very expensive and up-to-date system of fire fighting must depend very largely upon the details of equipment and methods for its use.

GENERAL TECHNICAL EFFICIENCY.

As efficient fire fighting is so essentially a branch of practical engineering, calling for trained engineering skill almost as much as artillery and railway construction service, it is advisable that one or more technically trained engineers be employed permanently by the Fire Department to point out ways and means of improving the efficiency of the department's work. An engineer after gaining a year or two experience in the Fire Department should be able to offer valuable suggestions to the commanding officers in regard to the proper handling of threatening fires and as to generalship in meeting difficult situations. In both of the two latter respects the work of the New York Department has seemed to the writer to be below a desirable standard. This is not intended to imply that the responsible officers of the New York Fire Department are either incompetent

or below the usual standard of ability to be found in Fire Chiefs. It merely indicates the writer's belief that sound technical training and education added to experience makes a more successful combination than experience alone. As a rule Fire Chiefs have few opportunities to obtain either a technical training or an engineering education and yet it is obvious that both of these valuable acquirements can be used to good advantage in the execution of their professional work. It is to make good the deficiency along these technical lines that the writer urges the permanent employment of trained engineers by the Fire Department.

Among the many subjects on which a competent engineer could offer valuable counsel would be the following:

Classifying and marking hydrants according to the adequacy of their water supply.

Intelligent co-operation with waterworks engineers to secure improvements in the water supply.

Use of auxiliary appliances including separate high pressure fire main systems, building standpipes, connections to sprinklers, so-called water curtains, local appliances, etc.

Care, maintenance and operation of fire engines.

Use of large hose and siamesed lines.

The selection of nozzles properly adapted to circumstances.

The most effective use of water towers, turret nozzles and other appliances to deliver powerful streams.

The use of chemical engines and combination wagons, small streams, searchlights, etc.

Strategy against threatening fires.

Selection of equipment.

Acceptance tests for new apparatus.

More efficient maintenance and operation of the fire alarm system.

Requirements for future development of the Fire Department.

IMPROVEMENTS RECOMMENDED.

Water Supply.

1. That an exhaustive study be made of the hydrants and distribution system throughout the city, for the purpose of grading and marking the hydrants so as to indicate the probable capacity of each hydrant under conditions of great draft. The hydrants with inadequate and with ample water supplies should be indicated on maps supplied to all Fire Department officers, and the actual hydrants should be conspicuously marked with their respective gradings.

2. That one or more trained engineers be attached to the Fire Department, and that these engineers report all cases of inadequate water supply actually encountered at serious fires. The engineer's reports should be so drawn up as to present the defective conditions accurately to the Department of Water Supply with suggestions indicating the proper remedy to meet the defects.

Selection of Hydrants.

3. That the trained engineers referred to in the last preceding recommendation draw up general instructions concerning the proper

selection of hydrants by engine companies at serious fires. It is suggested that after ten engines have responded to a fire in a location where the adequacy of the water supply is doubtful, all succeeding engines shall be stationed on large mains which preferably do not pass directly by the scene of the fire.

4. That one or more of the engineers previously referred to respond to every second alarm, and assist the commanding officer in locating late arriving engines at suitable hydrants.

5. That definite instructions be sent to all officers in charge of large size engines specifying which individual hydrants are to be avoided by them.

Attaching to Hydrants.

6. That the use of small size hydrant connections and small hydrant outlets be limited as far as possible to the engine company which is "first due" at any fire.

7. That the practice of connecting two engines in tandem to a single hydrant be restricted exclusively to those hydrants where the adequacy of the water supply is beyond question.

Operation of Engines.

8. That each engineer of steamer receive frequent practice in operating his engine under competent supervision.

9. That the engineers of steamers be given adequate instructions in the technical features of their work, and that this instruction be continued after they have become permanent engineers. They should be instructed in all the symptoms indicating trouble in the engines and how to cure all minor defects. They should also become familiar with the methods for ascertaining the slip of the pumps and should make tests periodically to determine the condition of their engines. These tests should be made under competent supervision. Any engineer showing lack of ability or incompetence should be either returned to the ranks or be required to pass again through the training school for engineers.

10. That the rule limiting steam pressures to 80 pounds be rescinded.

11. That no engine while playing a stream larger than 1¼ inches shall attempt to play a second stream.

Arrangement and Selection of Hose.

12. That engine companies shall run two lines of hose to a siamese connection whenever the full power of the engine is required and the engines are not stationed in close proximity to the fire.

13. That engine companies be given sufficient practice in handling siamesed lines to make them proficient in their use.

14. That at least 1,200 feet of 3-inch hose be kept loaded on a reserve hose wagon in every battalion, ready to respond to all second alarms in that battalion district.

15. That the trained engineers (see the second recommendation under "Water Supply") exercise supervision over the arrangement

and length of lines of hose used at serious fires, criticising in their reports all superfluous hose and other objectionable features observed.

Selection of Nozzles.

16. That nozzles of larger size than 1½-inch be used by first size engines in good condition when the full power of the engines is called for and the water supply is adequate.

Use of Water Towers.

17. That careful discretion be exercised in the use of the deck pipes in conjunction with water tower streams. It is recommended that a connection with a controlling gate be made between the deck pipe inlets and the tower inlets on each water tower. By the use of this connection the stream from either nozzle could be augmented at will at the expense of the other stream.

18. That regular provision be made in the assignment book for the response of two water towers to third alarms from localities where their services may be needed.

19. That the water towers be equipped with guy ropes in anticipation of their use with the new high pressure system.

Use of Standpipes.

20. That whenever a building standpipe is used, a company officer or chief be made responsible for seeing that it is not taxed beyond the capacity of the engines by which it may be supplied. He should be made responsible for securing additional supply from other engines when necessary.

21. That an investigation be made into the practicability of establishing one or more standpipe companies. The purpose of such companies would be to raise adequate lines of hose to the roofs or upper stories of high buildings more expeditiously and effectively than is done at present.

Automatic Sprinklers.

22. That the rule calling for the attachment of fire engines to sprinkler connections be made obligatory and be strictly observed by the Fire Department.

23. That the authority now vested in the Fire Department to require the installation of standpipes and other appliances in building of certain specified heights or occupancies, be extended to cover all buildings which may add materially to the general fire hazard of their localities.

24. That automatic sprinklers be specifically included among the auxiliary fire appliances which the Fire Department is authorized to require installed.

25. That connection with the new high pressure system be required as a duplicate source of supply for all automatic sprinkler installations situated within the territory protected by this service. This recommendation is based on the proposition that a reliable sprinkler equipment in any building adds to the security of its neighbors against a sweeping fire. Consequently, as a matter of general protection for the city, every sprinkler installation should be made as reliable and efficient as possible. Connection with the high pressure

system—even through a service pipe of size small enough to prevent serious accidental bleeding of the system—will undoubtedly add to the reliability of any sprinkler installation.

Chemical Engines.

26. That an adequate equipment of chemical apparatus be provided, so that at least two of the companies responding to every alarm shall be equipped with chemical tanks of large size. It is recommended that at least one chemical engine company be established in each battalion district, and that in addition, one or more companies in each district be equipped with chemical tanks.

Ladder Service.

27. That the equipment of each of the principal ladder companies include at least one portable extension ladder over 50 feet in length.

28. That more frequent use be made of ladders in attacking fires which have to be handled by outside streams.

Miscellaneous Appliances.

29. That an adequate equipment of smoke helmets of a more efficient type than the one now in service be provided.

30. That individual firemen be given suitable training and practice in the use of smoke helmets so as to be fully prepared for any emergency likely to arise.

31. That at least one aerial ladder truck in each battalion be equipped with a suitable ladder pipe.

32. That a deluge set, turret nozzle or similar appliance to facilitate the use of powerful streams be carried by every engine company. Careful tests should be made of the relative merits of such devices in order to secure the most efficient type.

33. That all 3-inch hose be equipped with 2½-inch couplings having threads to fit the couplings on the 2½-inch hose.

Use of High Pressure Service.

34. That only moderate pressures be maintained at the hydrants for ordinary service.

35. That a full equipment of specially designed reducing valves and gauges be carried by every engine or hose company which is likely to be called to a fire in the protected district. Spare equipments for emergency use should be kept in every battalion within the district.

Technical Efficiency.

36. That high class instruction in engineering principles and their application be provided for all assistant foremen and higher officers. This instruction should be recognized in the examinations for promotions to high positions. (See also in this connection Recommendation No. 2 under Fire Methods—Water Supply, which calls for the employment of one or more trained engineers by the Fire Department.)

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Dry Cleaning and Dry Dyeing Establishments.

An Ordinance to Regulate the Use of Carbon Bisulphide, and Gasoline, Naphtha, Benzole and Other Light Petroleum and Coal-Tar Products in Dry Cleaning and Dry Dyeing Establishments in Cities.

Section 1. Be it ordered by the Council of the City of———: That it shall be unlawful for any person, persons, firm or corporation to carry on the dry cleaning or dry dyeing business in the City of——— without complying with the regulations herein below set forth.

(a.) No dry cleaning and/or dry dyeing business shall be operated or carried on in any building or structure where same is exposed within the distance of 25 feet by any building occupied for business, dwelling or manufacturing purposes.

(b.) For the purpose of this ordinance, a dry cleaning and/or dry dyeing business is defined to be the business of cleaning or dyeing cloth, clothing, feathers, or any sort of fabrics by the use of carbon bisulphide, gasoline, naphtha, benzine, benzole, or other light petroleum, or coal-tar products, or cleaning or dyeing by process known as dry cleaning or dry dyeing, where inflammable volatile substances are used.

Section 2. No building to be used for the business of dry cleaning or dry dyeing as above defined, or for the storage of volatile substances for use in such business, shall be located, constructed or maintained, until an application for permission to do so, accompanied by full plans and specifications of the structure and its location, shall have been filed with and approved by the City Inspector of Public Buildings.

(a.) Upon the filing of every such application the applicant shall pay to the City Inspector of Buildings a filing and inspection fee of two dollars.

(b.) All buildings used for the purposes of the business of dry cleaning or dry dyeing as above defined, must be of fire-resisting design and construction, not in excess of 2,500 square feet ground area, and not to exceed one story, or sixteen (16) feet, in height at any point, and without basement, cellar or open space below the grade floor.

(c.) All walls of such structure shall be of brick laid in cement mortar, or of reinforced concrete, not less than twelve (12) inches in thickness, or of skeleton steel frame and terra cotta construction, or of stone laid in cement mortar. The roof of such structure shall also be of fire resistive construction. There shall be no sewer connection from such structure, and the floor of same shall be of concrete construction laid on a level with the surface of the earth surrounding the walls, and be pitched at such grade from all of its walls as to secure perfect drainage-flow of all liquids to an underground cement lined pit or well of sufficient capacity to hold twice the quantity of liquids

that may be used or kept in such building. Said pit or well to be provided with an air-tight cover to be kept locked when not in use.

(d.) Wherever such structure is exposed by any other building within a distance of 30 feet all door openings in any of the walls of such structure shall be protected by the most improved pattern of self-closing automatic fire doors, and all window openings in such walls shall be protected by wired glass in metal frames and sash of the most improved self-closing type, or by the most improved pattern of self-closing fire shutters. Skylights shall be constructed of wired glass in metal frames.

(e.) Ventilating apertures of size not less than 10x6 inches shall be placed in the walls of such structure at or near the level of its floor, and be spaced not over six feet apart from center to center and be properly screened by wire mesh. Additional means of ventilating shall be provided by the location of an exhaust fan at a point in one of the walls, close to the floor of the structure, of such capacity as to insure a complete change of the air within the building enclosure each five minutes; the said fan to discharge into a metal pipe of sufficient area to carry off the vapors delivered by said fan; the said metal discharge pipe to be erected against the outside wall of the cleaning or dyeing structure, and to be carried two (2) feet above its roof, the top of said discharge pipe to be covered with an inverted "U" cap or gooseneck: such exhaust fan shall be in continuous service and operation during the handling or use of volatile substances within such structure.

(f.) As a means of fire extinguishment in any such structure, it should be equipped with two lines of one and one-half inch steam pipes, one line to be placed at or near the floor level, and the other at or near the ceiling level, each of such lines of pipe should be provided with perforations or jets of three-eighths inch diameter, spaced not less than 12 inches apart on a horizontal line. A quick-acting lever valve should be placed in the steam service line connected to these perforated pipes outside of the structure and not less than ten (10) feet distant from same, and to be accessible for operation in case of fire; steam supply for these perforated pipes should be continuously available for service.

(g.) No gas or gasoline engine, steam generating or heating device, nor any electric dynamo, or generator, shall be located, maintained, or used inside of, nor within a distance of ten (10) feet of any structure used for the business of dry cleaning or dry dyeing as above defined.

(h.) The lighting of such structures shall be secured only by keyless-socket incandescent electric lights, with globes or bulbs enclosed in vapor-proof receptacles, and all switches, cut-outs or fuses used in the installation and/or operation of such lights shall be located and operated from the outside of such structure. The entire electrical equipment must conform to the most advanced stage of the art at the time of installation.

(j.) The heating of such structure shall be secured only by the use of steam and/or hot water circulating systems.

(k.) Drying rooms used in connection with any dry cleaning or dry dyeing business as above defined, if under the same roof as the cleaning or dyeing department, must be separated from such department by a solid fire resistive wall, the only entrance to such drying department to be from the outside. Means for the ventilation of such dry room shall conform to the conditions provided in relation to cleaning or dyeing structures, and provision for the presence of steam jets for fire extinguishment must be complied with. If the drying room be a separate structure, it must conform in all respects of construction and equipment to the conditions named relative to dry cleaning or dry dyeing structures, as above.

Section 3. All volatile substances received for use in the business of dry cleaning or dry dyeing, as above defined, shall be stored in steel tanks, the shell of which may not be less than three-sixteenths (3-16) inch thick, the interior of such tank to be coated with approved rust preventive and all joints in same shall be calked in an approved manner.

(a.) No storage tank shall be placed, constructed, or maintained under a public sidewalk or in a sidewalk area.

(b.) No such tank shall exceed a capacity of 250 gallons, and each shall be buried underground to such depth as to secure a covering of earth of at least two (2) feet above the top of the tank at the surface level of the ground; or, such tank may be enclosed in a cement lined underground pit, having an arched cement roof at the level of the surrounding ground surface.

(c.) All such tanks shall be provided with a vent pipe, not less than two (2) inches in diameter, extending from the top of the tank to the outer air, and discharging at a point not less than two (2) feet above the roof of the highest building within a radius of thirty (30) feet of such pipe; said vent pipe must be provided with brass wire screen of 30 mesh at a point near the junction of the pipe with the shell of the tank, and also be provided at its discharge end with an inverted "U" cap or gooseneck.

(d.) All such tanks shall be provided with a filling pipe of not less than two (2) inches in diameter, extending from the top of tank shell to within one (1) inch of the bottom of the tank; each such feed pipe shall be provided with two brass wire screens of 30 mesh, one of such screens to be placed in the pipe at or near its junction with said tank and the other immediately above the controlling cock or valve at its intake end; said filling pipe must be laid with inclination toward the tank to secure proper drainage; the intake end of said feed pipe shall be fitted with a controlling feed cock or valve which shall be kept closed except while in use, and the intake end of the pipe above such cock or valve shall be provided with a screw cap secured in place by an iron or other metal chain; such screw cap to be securely screwed on the feed pipe inlet when same is not in use. Both the controlling cock or valve and feed pipe inlet must be enclosed in an iron box or hood, set level with the surface of the ground and be kept securely locked when not in use; such feed pipe inlet and controlling cock or valve shall in no case be located inside of any building.

(e.) All pipes connected to such storage tanks must enter or be attached to same at the top; service pipes carrying the volatile substance from storage tank to the cleaning or dyeing processes shall extend from the top of the tank shell to within two (2) inches of its bottom and be provided with brass wire screens of 30 mesh at or near its junction with the shell of the tank and also below the controlling cock or valve at its delivery end inside of the cleaning or dyeing structure; such controlling cock or valve shall be kept closed when not in use.

(f.) No volatile substance shall be carried or conveyed into the cleaning or dyeing structure or any of its apparatus or machines, or be returned to the storage tank from such devices, except through service pipe as above described; the movement, or transmission of such volatiles through said service pipe shall be secured by pump or syphon only, such devices to be so located as to insure the return of all volatile substances remaining in the service pipes when delivery is shut off to the storage tank by gravity.

(g.) All volatile substances to be used for cleaning or dyeing purposes shall be kept in tightly closed machines or apparatus during the processes incident to said operations of cleaning or dyeing.

(h.) The use, storage or handling of any such volatile substance in vessels, vats, pans or devices of any kind which are open to the air is absolutely prohibited.

Section 4. No greater quantity than five hundred (500) gallons of any volatile substance shall be stored or kept on hand at any one time at or near the location of any dry cleaning or dry dyeing establishment, and then only under the conditions above specified by special permit of the City Inspector of Public Buildings.

Section 5. Any person, firm or corporation that now has, or shall establish, or carry on a dry cleaning or dry dyeing business in violation of this ordinance, shall, on conviction, be punished by a fine of not less than ten dollars, nor more than fifty dollars, for each day's continuance in said business, and the cost of prosecution.

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Nitro Cellulose
And Its Products.

A brief article dealing in a general way with that portion of the subject of Nitro Cellulose, coming under the head of Pyroxylin Plastics, a name used by the Census Department of the United States Government as a generic or group name for Celluloid and similar products such as Fiberloid, Viscoloid, Pyraline, etc.

CELLULOSE.

The base of all forms of pyroxylin plastics is cellulose: a cellular substance present in almost all forms of vegetable growth combined with other substances in various proportions.

Clean cotton batting is nearly pure cellulose, and was the first material employed (as the most desirable form of cellulose) in the making of military nitro-cellulose or guncotton, from the time of its discovery, about 1845. In the manufacture of soluble guncotton (the form employed in the manufacture of pyroxylin plastics), cotton batting has been displaced by other forms of cellulose, such as cotton yarn, owing to its greater degree of freedom from resinous matters, etc. At the present time cellulose in the form of paper is largely employed, the paper being cut into narrow ribbon, a form which adapts itself readily to economical handling and treatment in the processes through which it passes. The cellulose, unless in the form of paper, is first washed, to remove any grease or foreign matter, and then dried at a low temperature. The drying process is necessary, even if paper is employed, as any moisture present tends to weaken the acid into which the cellulose is dipped, and interferes with the result.

NITRATING.

Simple cellulose is incapable of forming these plastics under consideration, as it is insoluble in almost all of the ordinary solvents, and the cellulose must be nitrated to render it soluble.

By treating it with nitric acid, nitro-cellulose compounds are formed. These compounds vary according to the temperature and strength of acid employed. The higher temperature and stronger acids produce more highly nitrated products, that is, more of the radical of the nitric acid enters into and becomes a part of the cellulose molecule.

In the manufacture of plastics the aim is to avoid the production of the highly nitrated cellulose, and obtain the lower product as the latter is soluble in alcohol and ether, while the former is more insoluble.

The nitration is usually effected in stone jars of a few gallons capacity, and when completed the nitro-cellulose is removed to a centrifugal extractor to remove all possible acid and is immediately washed in water. This is usually done in churns or the beater engines such as are used in a paper mill. The complete removal of all uncombined acid is essential to the safety of the succeeding processes and the stability of the pyroxylin

plastic subsequently produced. To accomplish this the nitrated cellulose is washed, the water being replaced by fresh water perhaps a dozen times. Sometimes it is boiled and generally some antacid is added to the water. This may be ordinary sodium carbonate or it may be some complex organic compound.

Nitro-cellulose containing traces of free acid or nitrated foreign substances such as small particles of resinous material, etc., is a distinctly hazardous and uncertain compound. It may decompose gradually, with the evolution of brown fumes (Nitrogen Oxides) and result in nothing but the deterioration of the nitro-cellulose; or after the decomposition has begun as above it may proceed rapidly accompanied by flame. It is therefore a matter of great importance that the cellulose should be free from any foreign matter, and that the nitro-cellulose should contain no free acid. The materials used as antacids are, with exception of such substances as sodium carbonate, etc., trade secrets with the manufacturers.

Formerly the nitro-cellulose was dried after washing, but frequent fires and explosions resulted in the abandonment of this process. At present the nitro-cellulose after washing is placed in a centrifugal extractor, and as much water as possible removed. It is then mixed with solid camphor, then wrapped in cloth and placed in a press with sheets of absorbent paper and pressed. It is then removed to dry houses. A low temperature (not over 120° F.) is maintained, as the loss of camphor at higher temperature is an important matter.

After drying, the cakes are broken in a machine having serrated discs of bronze, in which the mixture is reduced to a coarse powder, then mixed with enough wood alcohol to render it somewhat plastic, and after kneading is passed through steam heated rolls. In this stage the materials dissolve into each other and the mass becomes transparent.

If white or colored product is desired the necessary pigments are introduced in the "breaking" process. Zinc white (zinc oxide) is the pigment usually used, and a variety of coloring matters for other desired colors.

After thorough incorporation and while plastic, the mass is pressed into a cake, several inches thick, if sheets are desired, or into any suitable molds, if specific forms are required.

The cakes are chilled, and after hardening or drying sufficiently by evaporation of alcohol, are cut into sheets of required thickness. Drying usually for several days at a low temperature (not much above 100° F.) is required to remove the last of the alcohol. In this process the sheets shrink and warp, and they are then placed in a steam heated press, between polished metal plates, and being softened by the heat, a gloss surface is produced in contact with the polished plates.

PRINCIPAL HAZARDS.

There is practically no great hazard in the process previous to the drying of the nitro-cellulose. The acids employed are sulphuric acid 1.84 specific gravity, and nitric acid of about 1.4 specific gravity. These are sometimes mixed at the plant or purchased mixed. Nitric acid of this strength is capable, under certain conditions, of igniting light combustible matter such as paper, straw, etc., with which it may come in contact.

The nitro-cellulose while wet is not specially hazardous, as it burns only feebly as it dries.

The drying of nitro-cellulose is a hazard, and while it is true that the presence of camphor tends to somewhat decrease the tendency to decomposition by heat, the presence of nitro-cellulose dust or any elevation of temperature is likely to cause trouble.

The "breaking" of the cake is a hazard. Fires occur in these machines, and the cause is not always ascertained. It may be due to foreign substances being present, or it may be due to frictional heat. They should be isolated and the amount of material so limited that other processes and other parts of the plant are not endangered by them. The subsequent processes above described do not offer any serious hazards other than the presence of the material itself.

All pyroxylin plastics soften sufficiently to mold and work easily at or below 250° F., while only very thin sheets (a few one-thousandths of an inch in thickness) decompose when heated at a temperature under 300° F.

Owing to the great advance in the price of camphor of late years, efforts have been made to secure a satisfactory substitute, but it is thought that no good substitute has been found, although it is stated that a small percentage of camphor has been replaced by these substitutes, in some places.

GENERAL USES.

Pyroxylin plastics are used more extensively perhaps in comb factories than in any other line of manufacture. Here the material is worked, sometimes sawed on a circular saw, and heated on steam plates to soften in order to mold.

If the pyroxylin plastic at this stage known as "plates" is left upon the steam table too long, a decomposition begins and the plate is said to blister and is ruined. Occasionally these plates ignite and burn, but it is said to have occurred only when they have been covered by a board or weight to prevent warping.

Sawing of the plates occasionally causes ignition of same, due perhaps to frictional heat or to some foreign substance such as metal or mineral in the plate. If sawed wet there is practically no hazard.

Most manufacturers receive back celluloid scraps from their customers. This material is liable to contain foreign material. It is sorted over before being used again, and the manufacturers endeavor to have it free, in order to prevent injury to the machines caused by these substances.

In thin sheets it is used largely for badges, buttons, etc., also in molded forms for same purposes.

Pyroxylin plastics are polished on cotton buff wheels but no oil or grease is used. Frequently ashes and water are employed.

The cheaper grade of articles are polished by dipping in glacial acetic acid which is a solvent for this material. The surface is softened or dissolved by the acid, the latter is afterwards driven off in steam heated closets and the surface of the articles has a varnished appearance. The process is without hazard.

Wooden clock cases, wooden tanks and other wooden articles coming under the head of plumbing supplies for bath and toilet room, are frequently covered with these plastics in sheet form in various colors. The

cement used for attaching to wood is usually plastic scraps dissolved in wood alcohol containing acetone. The thin material readily follows the contour of the object when aided by steam and hydraulic pressure. Process non-hazardous if steam is used for heating cement.

Knife handles and piano keys are frequently made of or covered with these plastics. The only hazard being due to the waste in the sawing and buffing. The matter of caring for the dust and waste is a more difficult problem than that of wood dust. The tendency of these plastics in finely divided condition to ignite when heated to a temperature somewhat below 300° F. and the rapidity of the ensuing combustion, offer the ever-present possibility of a dust explosion in the metal conveyors and receptacles of an exhaust fan system of removing waste, and in cases where only comparatively small quantities of material are used and the waste is frequently removed, it is a question whether the hazard is reduced by the introduction of an exhaust system. If an exhaust system is employed it should be a separate system for the collection of this kind of waste only and the collecting receptacle located away from building. The basis of the photographic films in common use, and the films of moving picture machines, is pyroxylin plastics, and the rapidity of their combustion when ignited is well known. These films are commonly coated upon each side, the thickness of the pyroxylin plastic film being about .003 while the finished film is about .005 inches thick. This coating, largely of gelatine, has a retarding influence on the ignition at low temperatures of the plastic material. When heated slowly to about 320° F. they almost invariably decompose with evolution of fumes but no flame, while the same material, freed from this coating of gelatine, will burst into flame at 250 to 275° F.

Pyroxylin plastics are used largely in the making of collars and cuffs, frequently with a linen or cotton fabric between two thin sheets of material, to which it is cemented or made to adhere by heat and pressure. The articles are molded in the desired form on steam heated molds and it is thought that no direct hazard attaches to the processes of this class of manufacture.

It would be difficult to enumerate all the articles into which these plastics enter, eyelets, toilet articles, articles for the desk, the pocket, etc. The writer, a few years ago, found some of the imitation candle gas burners in which the candle proved to be a hollow cylinder of pyroxylin plastic.

BEHAVIOR OF PYROXYLIN PLASTICS.

There does not appear to be any fixed line or limit between rapid combustion designated burning and the more rapid combustion called explosion. Among explosives, different rates exist, and the rate of combustion of a mixture such as smokeless powder, varies according to the size of the particles or grains in which it is prepared.

All the evidence obtainable seems to indicate that pyroxylin plastics in solid form do not explode when heated or ignited. That is, if they are enclosed in a chamber or box and decomposed by heat, inflammable gases are evolved and the pressure created is simply due to the increased volume of gases and vapors. If the containing vessel is so large that sufficient air is present for the combustion of these vapors, explosion is likely to

follow. The vapors behave similarly to any other combustible vapors, when mixed with sufficient air they are explosive.

The statement is sometimes made that pyroxylin plastics can burn under water, which is equivalent to a statement that they contain enough oxygen to burn in a confined space, similar to powder or explosives. This statement is untrue as applied to these products as found in trade today. It is possible that sufficient nitric acid might be present in a mixture, prepared with that purpose in view, to allow of such result, but not in these products as found. Experiments prove that if water is applied in sufficient quantity to burning plastics or carbon dioxide (carbonic acid gas) in sufficient volume to form a protecting envelope about the burning mass, to the exclusion of air, the combustion is instantly checked and the fire extinguished.

Experiments seem to indicate that if the decomposition of these plastics by heat is begun at one point in the sample, it continues progressively through the mass with the evolution of vapor or gas but no flame. If the decomposition is not local but general throughout the mass, then when it reaches the critical point the change from solid to vapor is almost instantaneous and flame generally follows, probably due to the amount of heat instantaneously evolved.

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Editorials.

This Association was formed **To Promote the Science and Improve the Methods of Fire Protection and Prevention.** We started on our campaign against the fire waste over twelve years ago, and looking back we have reason to congratulate ourselves on the work done and the results accomplished.

When, however, we look only at the present, and see the dangers on every hand and the apparent preference of the general public to remain in blissful ignorance of the dangers, we may perhaps be pardoned for having a sense of discouragement.

Those whose business brings them in contact with the fire loss know its importance and realize the grave dangers that exist. They know that there is real and imminent danger of conflagration in our large cities, which might easily be of sufficient magnitude to seriously injure our national credit and bring about financial panic and disaster.

They know that the fire waste has rapidly increased during the last few years and that if it continues to increase in the same ratio it will soon become a burden so severe as to seriously deplete the resources of this country notwithstanding its exceptional natural wealth.

On the other hand we know that there is a remedy and we believe it is both possible and feasible to materially decrease the fire waste. All we ask is the attention of the public, that they give the problem some study, and we are sure that when they come to a full realization of the conditions which surround them they will take prompt action.

We have under way a campaign of publicity and apparently it has already done much good in arousing interest in the subject of the fire waste.

Furthermore, we note that during the last few months there has been an increase in activity along these same lines in several quarters as evidenced by newspaper and magazine articles, and various public meetings. This is certainly encouraging and should lead us to greater efforts. We want the public to know and understand that we are working to improve conditions, that we have in our ranks those who have made a life study of how to prevent and control fires, that we wish to impart this knowledge to all interested, all to the end that the fire loss may be diminished.

A movement looking toward the formation of a National Assembly made up of organizations and individuals interested in the preservation of life and property from fire, has been inaugurated by the Ohio State Fire Prevention Association.

A committee was appointed which reported as follows:—

Your committee believes, after due consideration, in an organization under such broad lines, including all the forces of this broad land for the purposes of educating the public, bringing about more substantial building laws with all their interests centered upon the one object of reducing the loss of life and property; no one will gainsay the fact that such an organization is important to every state in the Union and its tax payers, as well as to the insurance companies and would assume a position paramount to that of any other organization of its character in existence, and its usefulness and importance would be immediately recognized.

We believe that such an organization should invite in its membership not only the State Fire Prevention Associations, but include officers, general agents and managers of insurance companies, officers of rating bureaus, state insurance commissioners, state fire marshals, architects, builders, chiefs of fire departments, superintendents of fire patrols and salvage corps, mechanical, electrical and chemical engineers, local board organizations represented by delegates and any other individual or persons deputized as delegates from any organized body, or office interested in the preserving of life and property from fire and in reducing the great fire waste of this country.

We further believe that such an organization as outlined should act in conjunction and in perfect harmony with the National Board of Fire Underwriters and by indorsing and approving such devices as bear the stamp of approval of the Laboratories at Chicago.

We therefore recommend that this association appoint a committee of three or not more than six of its members to be known as the National Assembly Committee with full power to act for the purpose of communicating and conferring with all other organizations whose object is in whole or in part interested in the preserving of life and property from fire to the end that such a National Assembly may be organized to bring about very much increased and better results redounding to the credit of every state, their tax payers, as well as to the insurance interests and the public generally.

In commenting on this situation we cannot perhaps do better than to quote from the editorial columns of The Insurance Field:

The effort to nationalize the fire prevention movement suggested in Ohio last week reflects credit upon the motives of the Association in that state. It is well to consider, however, that the National Fire Protection Association is largely if not wholly engaged in exactly the same work which the proposed new National Assembly of Fire Prevention is intended to promote. The membership of the National Association is also designed to bring in everybody who is interested in the subject from any and every standpoint. It is now twelve years old and has among its members all the organizations in this country occupied with the work of preventing and limiting fires. It would seem better and easier to concentrate upon the development of this Association and to expand its benefits than to organize another with the danger of providing conflicting standards. The most distinguished practical insurance engineers in the United States belong to the National Fire Protection Association and the standard of preventive appliances and measures adopted by that body has greatly increased immunity from fires. Its publications are authoritative, though there might well be more frequency in their distribution. The Ohio committee charged with the duty of promoting a National Assembly might well confer with the officers of the N. F. P. A. and ascertain if it is not feasible to take steps to popularize the work already under way and so enlarge the membership as to take in all the elements that are comprehended in the proposed new movement. There is much room for expansion, even if it must be done by two bodies instead of one; but it might be wise to just see what is possible by making the already existing body stronger and more efficient.

A movement has been started in Tennessee to educate the public with a view of reducing the fire waste in that state. Governor Patterson, Fire Commissioner Folk, and the Tennessee Underwriters' Association are back of this movement, and a conference is being arranged to consist of the mayors of the various cities and county seats, the leading manufacturers, merchants, local insurance agents and representatives of commercial organizations. Attention is called to the heavy fire loss and the need of special legislation.

In the State of Connecticut, we also note that steps are being taken towards the formation of an association of fire service officials, to work for fire prevention legislation and the general improvement of fire conditions in the state.

It is proposed to call the new organization the Fire Prevention Association of Connecticut and membership to be open to present and past fire commissioners, fire chiefs, fire marshals, building inspectors, fire wardens, and the authorities in charge of local fire service. The object of the Association will be to work for the prevention of fires by the enactment of proper state laws and their enforcement.

Notwithstanding the lessons taught by the Collinwood School disaster, it would appear that comparatively little has been done to improve the conditions and safeguard the lives of our children. It is true that in some localities improvements have been made, such as fire escapes, chemical extinguishers, fire drills, etc., and in a few cases automatic sprinklers have been installed. The fact remains that the large majority of our schools are unsafe, poorly constructed, and without proper protection.

It would seem that the only solution is the passing of state laws requiring all school buildings to be either of fire-proof construction or equipped with automatic sprinklers as well as providing other well recognized safeguards. In a single copy of the Journal of Commerce a few days ago there was mention of three schoolhouse fires, one of which occurred while school was in session and seriously endangered the lives of the pupils. **Is it not time to act?**

In going over some old papers the writer came across a court decision rendered a few years ago in the state of Vermont, and which is apparently unique in that the judge held the property owner negligent in not providing proper protection against fire. That portion of the decision referred to reads as follows:—

Neither can we say, as matter of law, that the jury was not justified in finding, if they did so find, that the absence of automatic sprinklers in a building in which so much inflammable matter was present, was not, considering the extent to which they had been introduced, negligence on the part of the defendant, or that if the building had been equipped with them they might not have checked the fire, and ultimately have been serviceable in extinguishing it.

A special committee of the National Board of Fire Underwriters presented its views on the fire waste at the Joint Conservation Conference in Washington, and proposed that this question be made a fifth division of the work laid out by the Conference. The Special Committee consisted of J. Montgomery Hare, A. W. Damon, C. G. Smith, Geo. W. Babb, R. M. Bissell, R. D. Benson, R. E. Warfield, and the report of this committee is given in full as setting forth the opinions of the Insurance Companies as to the needs of the times in the reduction of the fire loss.

In considering the waste of the national resources we cannot fail to have in mind, as underwriters, the vast destruction of values by fire year by year in the United States. Your commission has admirably divided itself into sections to take cognizance of the entire subject in a fourfold view—"Waters," "Forests," "Lands," and "Minerals"—indicating the intention of broad and thorough treatment. We could have desired that the diagnosis should have proceeded a step further and added "Fire" as a fifth division, and we trust that what follows will make clear the desirability of some specific treatment of this branch of the subject.

Amount of Fire Waste.

The annual fire waste in the United States for the last four years was $1,257,716,955, or an average annual loss of over $251,000,000. This is a daily aver-

age loss of $689,160. It is true this period includes the San Francisco and Baltimore fires. Extending the period to ten years the loss was $2,029,734,345, giving an average annual loss of $202,793,434 or an average daily loss of over half a million dollars ($556,091). This waste is an absolute loss of the wealth of the country. The property value destroyed by fire is gone beyond recovery. Insurance only shifts the distribution of the loss. An irrecoverable loss it still remains.

If this enormous waste and drain were unavoidable, this committee would have no mission nor function here; but much the larger portion of this loss of property is preventable. The irrefutable evidence of this is the extraordinary difference in the fire waste of European countries and the United States.

From reports of United States consuls it has been shown by our committee on statistics that the loss in six European countries for a period of five years was 33 cents per capita. The loss in the United States for the five years ending with 1907 was $3.02 per capita, nearly ten times as much. The result in thirty foreign cities gave a per capita loss of 61 cents as against $3.10 in the five years' average of 252 cities in the United States.

Taking the number of fires to each 1,000 population in the same cities, our committee on statistics found it to be 4.05 in the American cities, as against 0.86 for those of Europe, showing also that, in point of frequency, fires here are far in excess of those abroad.

It is to be borne in mind that the direct fire loss is not the only waste of resources—owing to the greater frequency of fires in the United States and their greater destructiveness, more expensive fire extinguishing facilities and apparatus must be maintained here. We may add that it has been stated that as many as 7,000 lives have been lost by fire in the United States in a single year.

Excessive Difference Defined.

The excessive difference between the fire waste of European countries and that of the United States is caused principally by

First: The difference in the point of view and the responsibility of the inhabitants of Europe and those of the United States.

Second: The difference in the construction of buildings.

Third: The difference in the regulations governing hazards and hazardous materials and conditions, and in the enforcement of such regulations.

Referring to the first mentioned cause of difference it may be remarked that in a portion of Europe a landlord is responsible to his tenants and neighbors for any fire loss due to negligence, and tenants are responsible to the landlord and to their neighbors for any loss due to their negligence. In this country a whole city might be destroyed by the unmitigated carelessness of some person, and there would not be the slightest penalty incurred. In Europe wastefulness is generally viewed as indefensible, and a person who has a fire is regarded in an unfriendly light, since he has endangered his neighbor's property and comfort. In this country everybody is permitted to endanger his own and his neighbor's property almost *ad libitum*, either by the absence of wholesome regulating ordinances or by their non-enforcement. The reckless wastefulness of our people is nowhere more apparent than in the unnecessary fire drain on their resources. Our people appear to have a very erroneous idea of fire insurance and to think that insurance payments re-create destroyed values; whereas the fact is that insurance companies are in a sense tax collectors and distributors of such taxes among those suffering loss by fire.

The difference in the ideas of thrift; in view of the responsibility to neighbors; in the perception of the real meaning of fire loss or waste, are the cause of the larger number of fires per capita in the United States and perhaps of the larger loss per capita.

The next principal cause of our excessive fire waste is our faulty construction. Our buildings as a whole are more flimsily constructed and are larger and higher than in the countries of Europe, where the building laws are safer and better enforced.

Our statement of the third cause of the excessive fire loss in the United States, namely, the lack of regulations to govern hazards, is self-explanatory and need not be amplified in this brief address.

The National Board of Fire Underwriters, which this committee represents, devotes its energies and activities to the reduction of the fire waste and the safeguarding of property and life, and has nothing to do with rates of premium. It

confines itself to matters in which fire insurance companies have a common interest and most of which also deeply concern the public.

Inspection of Cities.

Thus, through a committee on fire prevention, commanding the services of a corps of engineers, the cities of the country are systematically inspected by the National Board of Fire Underwriters with a view of pointing out defects in water supplies and fire department equipments, and copies of these reports, with our recommendations for improvements, are presented for the free use of municipalities; an extensive laboratory plant is supported for the purpose of testing materials and devices of a hazardous nature entering into the problems of fire protection; a model building code has been adopted, ten thousand copies of which have been distributed to cities and towns in the United States; an arson fund is subscribed from which over a million dollars in rewards have been offered for the conviction of incendiaries; nearly half a million of standard rules and lists of hazardous and protective devices and materials were during the past year alone circulated to the public free of charge; hundreds of thousands of copies of the rules to regulate electric installations are annually distributed, and in every way possible we have endeavored to create a sentiment which should tend to place some check upon the constantly increasing destruction of values by fire.

Essential Requirements.

The committee believes that the present fire waste in this country is an unnecessary national calamity and that to reduce it, it is essential

First: That the public should be brought to understand that property destroyed by fire is gone forever and is not replaced by the distribution of insurance, which is a tax collected for the purpose.

Second: That the states severally adopt and enforce a building code which shall require a high type of safe construction, essentially following the code of the National Board of Fire Underwriters.

Third: That municipalities adopt ordinances governing the use and keeping of explosives, especially inflammable commodities and other special hazards, such as electric wiring, the storing of refuse, waste, packing material, etc., in buildings, yards or area ways, and see to the enforcement of such ordinances.

Fourth: That the states severally establish and support the office of fire marshal and confer on the fire marshal by law the right to examine under oath and enter premises and to make arrests, making it the duty of such officer to examine into the cause and origin of all fires and when crime has been committed requiring the facts to be submitted to the grand jury or proper indicting body.

Fifth: That in all cities there be a paid, well disciplined, non-political fire department adequately equipped with modern apparatus.

Sixth: That an adequate water system with proper distribution and pressure be installed and maintained. In the larger cities a separate high-pressure water system for fire extinguishment is an absolute necessity, to diminish the extreme imminence of general conflagrations.

If the commission can excite the interest of the people, the states and municipalities in the unnecessary and indefensible waste by fire in this country and the remedial measures herein recommended, they may hope to have accomplished something toward diminishing, if not entirely removing, this national misfortune.

Public Opinion Awakening.

There are already signs of an awakening public opinion on this subject. Many of the governors have mentioned it in their messages to legislatures; the insurance commissioners of the various states have frequently pointed it out and urged action, and recently the public press has shown an inclination to print articles on the subject. A law is now upon the statute books in Ohio requiring text-books to be read in the schools on the "Dangers and Chemistry of Fires."

As long ago as 1892 a committee of this board addressed the President of the United States on the destruction of life and property by fire. As was expected, it appeared to him a matter for state rather than national legislation; and possibly this direction may now be given it through the connection of the governors of states with your commission. With state and municipal authorities working together

many of the reforms herein suggested can without question be effected, and if this presentation should result in accomplishing this, the desire of the interest we represent would to that extent be fulfilled and the welfare and prosperity of the country measurably enhanced.

Who Killed Cock Robin? We all remember this childhood tragedy and while from a literary standpoint the tragedies of Shakespeare may have in later life made a stronger appeal, it is doubtful if any tragedy of the English language is more familiar than that of Cock Robin. Why is this so? My answer would be that our childish minds fully comprehended the needlessness of the crime, the sacrifice of the thing of beauty without any return, and our hearts went out in sympathy. Even then we could understand the sinful deed, and while we did not know enough to analyze we could appreciate that Mr. Sparrow was a villian, and either he should be put where he could do no harm or be deprived of the means of causing disaster.

Mr. A. F. Dean has given us a most valuable contribution to literature bearing on the fire waste and has appropriately entitled it "Who Killed Cock Robin." He evidently had in mind the needlessness of the fire waste, the criminal carelessness partly if not largely accountable, and the remedy —to safeguard the innocent by placing proper restrictions on the individual through state laws. We give below several extracts from Mr. Dean's paper which begins as follows:—

Our President and governors in solemn conclave have pleaded guilty, on behalf of the American people, to the sin of national waste.

He then covers the problem of "waste" in its broad sense, among other things calling this nation a "Race of Tree Killers." He calls attention to our tributes of life and property to the "Fire God" and shows how much greater these are in this country than across the water.

Is this startling difference between our experience and the experience of our transatlantic neighbors attributable to influences that are physical, moral or both?

* * *

An honest investigation could not but reveal that the enormous difference arises primarily from the attitude of the American public towards the phenomenon of fire waste—in fine, that the chief contributory cause is moral rather than physical. Other and older civilizations have learned to regard fire waste as a great and constant menace to public safety—a menace as portentous as war, pestilence or famine. They have learned that it is a thing to be crushed out at any sacrifice of the rights of the individual to the greater rights of the public. They have learned that fire waste emanates in larger part from either criminal indifference or criminal intent, and that to this extent it is preventable through laws which go directly to the root of the evil by holding the individual citizen to a rigid accountability for every act of omission or commission which tends to increase the danger. In all parts of Europe where the Code Napoleon prevails the law of Voisinage holds the landlord responsible for his negligence, to all concerned, tenants or neighbors, and if fire originates from carelessness of tenant, he is held responsible to all concerned, landlord or neighbors. This law places the responsibility where it belongs and works automatically in making everyone interested in having his premises as safe as they can be made by human foresight. This is not only strictly logical, but in harmony with the attitude of every civilized government in dealing with the spread of contagion.

* * *

Our national government is hedged about by constitutional restraints. It has, for instance, no control over fire waste or fire insurance. The right to legislate in regard to these important subjects belongs exclusively to and is jealously guarded by the several states. At the present time we have about forty-six separate bodies of state laws regulating fire insurance, but we would have to search carefully to find among them all a single effective law for reducing fire waste itself. In their details the laws of no two states agree, but in their spirit there seems to be a perfect agree-

ment in dealing with effects rather than with causes, and the difference between this country and Europe may be summed up as follows: In Europe fire waste is hedged about with every possible safeguard, while fire insurance, in common with other legitimate industries, is permitted to work out its own destiny; in the United States fire insurance is hedged about with every restriction that legislative ingenuity can suggest, while fire waste is permitted to work out its own sweet will.

No one can honestly study the facts and retain a shred of doubt that our shameful national waste is in largest part fire waste, nor that for the largest part of this we are indebted to state politics and state legislation, which have persistently ignored the evil itself and made use of one of its innumerable effects—fire insurance—for purposes of state revenue, additional offices and political piffle.

* * *

The moral responsibility for the criminal loss of life and property in the United States lies chiefly at the doors of the several states themselves.

* * *

Lastly, I desire to deliver this most solemn warning to the American people.

Most forms of waste are gradual—corrosive rather than explosive—hence in the face of timely warning they may be stopped or shunned, but the waste of the Fire Fiend is both corrosive and explosive. Within the short space of thirty-six years four of America's proudest cities have been laid low by fire. When you pick up your paper tomorrow morning you may be called upon to read the appalling details of another great city conflagration. Can the United States stand another of these cataclysms? No!

* * *

Another city conflagration in the early future would leave our entire commerce prostrate, both values and credit would be annihilated and our financial institutions, mercantile establishments, manufactories and transportation lines would be laid low by the worst panic of modern times.

* * *

But all this sinks into insignificance when compared with the possibilities of a great metropolitan conflagration *in the dead of winter.* Did it ever occur to you, fellow citizens, that every notable conflagration in this country has happened during the clement seasons, when humanity could endure the hardship of being driven outdoors to camp under the stars? The stories of suffering and death from exposure during the conflagrations of the past are pitiful enough, God knows, but picture to yourselves if you can the unspeakable horrors of such a conflagration in the dead of winter, the stinging wintry night, the north wind heaping the snow into impassable drifts, the vortex of flame crumpling block after block in its resistless heat, the hurried emptying of hotels, homes and hospitals, the lame, the halt, the blind, the sick and dying, the feeble and aged, the helpless infants, all driven out into a frenzied mass of humanity fleeing before the knout of the Fire Fiend into the hopeless black void—millions swept from a hell of heat to a hell of cold.

* * *

No man in authority can plead ignorance, for the records will show that for a generation or more fire underwriters have plead with legislators for a saner treatment of fire waste and have warned them of the consequences of their stubborn disregard of public interests. The peril is grave, my fellow citizens, and I add this stern warning to those which have gone before.

Fire—An American Extravagance. This is the subject of an article by F. W. Fitzpatrick, published in McClure's Magazine. Mr. Fitzpatrick is Consulting Engineer of the International Society of State and Municipal Building Commissioners and Inspectors.

His article deals with the waste of our resources showing that the fire waste is most important and as he puts it "We are a nation that burns down almost as fast as we build." He compares the fire loss in this country with other countries and emphasizes our cheap construction. He advocates fire-proof construction calling attention however, to the fact that many so-called fire-proof buildings are far from being worthy of the name. He states, "Forty-four per cent. of all our fire losses are directly attributable to the lack of proper window protection. Fire originates in

one building, but cannot be held there and is communicated to all the buildings in the neighborhood."

He concludes as follows, "The chief thing to use in building, however, is intelligence. It is a material that has been sadly lacking in our building enterprises heretofore; but they tell us that we Americans can do anything, so surely we can develope that quality and from now on build intelligently, correctly, and safely."

Burnt Money. In the January number of Everybody's Magazine is an article dealing with the fire loss which is along similar lines to the article in McClure's, and is further evidence of the belief that this subject is of popular interest. The article begins with an editor's note reading as follows:

"This is a record of shame. A sensational indictment of American extravagance. We knew that our national fire bill was startling, but the facts and figures that Mr. Adams presents here shocked us. They'll shock you. Not satisfied with slaughtering our forests, we are burning up our homes at a killing pace every year. We are pervaded with pride over our superiority to the rest of the world, while actually our fires cost us more than the combined loss of any other six civilized nations. Here are the figures in your faces. You can change the record. Mr. Adams shows how. Remember, we cannot as a nation waste our substance and prosper."

While the facts and figures in this and other articles are not new to those who have made any study of the subject, they will bear repeating many times so that a better understanding may be gained of their importance from the standpoint of public economy.

As a matter of fact a large proportion of our population are not only liable to serious loss, due to their own carelessness, but also are subject to the danger of fire from surrounding property, and should therefore be interested in the problem as a whole and do their part toward securing improvements in their neighbors' property as well as their own. Most people have an idea that their own property is safe. On the other hand they are quite as likely to believe that their neighbors' property is unsafe, and if they can be brought to a full realization of these external dangers, we may hope for radical reform.

Private Fire Protection and Insurance Rules. Mr. Gorham Dana, Manager of the Underwriters' Bureau of New England, read a paper on this subject before the New England Water Works Association. Mr. Dana called attention to the opposition frequently met with from waterworks departments to granting the privilege for private connections desired by the property owner and advocated by the insurance engineer. The latter certainly has no desire to be unreasonable and his experience with the needs of the case should have weight. Mr. Dana enlarges upon the necessity of private fire protection to decrease the fire loss and gives it as his opinion that the chief remedy lies in the automatic sprinkler. He gives a brief history of this device and its record also explains the insurance rules particularly as affecting the size of connection necessary from the waterworks system in order to secure satisfactory results. The objection

to meters was explained and in his opinion the general introduction of alarm valves and supervisory systems largely does away with the danger of using fire pipes for other than fire service.

He argues against making any charge for sprinkler connections from waterworks systems explaining that the property owner is entitled to protection and pays for it in his taxes and the fact that he makes use of the protection afforded by the waterworks system in a better way than his neighbor (i. e. by installing private fire protection such as automatic sprinklers) should make his taxes for such protection less rather than more. He concludes with a plea for co-operation with the fire protection engineer in his campaign to reduce the fire waste.

Fire Protection and Fire Prevention. Our Secretary, Mr. W. H. Merrill, made an address before the Buffalo Credit Men's Association on the above subject. He impressed upon these business men the importance of fire waste and the need of better protection bringing it home to them purely from a business standpoint. In commenting on the annual fire loss of over $250,000,000 he calls attention to what seems an even greater sacrifice, namely, the terrible loss of life which has been rapidly increasing of late years.

> Before the dollar marks I would write the list of those who have perished at the Iroquois Theatre in Chicago, on the steamer General Slocum at New York, in the hall at Boyertown, at the school in Collinwood, and in lesser numbers at many other places. The remembrance of their cries and the horrors which they suffered should appeal to us more strongly than the money loss, be it ever so large. What sacrifices would not be made could the children burned at the Iroquois, at Boyertown and at Collinwood be returned to their families. They would include some things greater than money, I am sure.
>
> Taking all of these factors into consideration, is this not then a subject of real present and vital importance to the American people?
>
> Many of us have discussed quite at length and formed fixed opinions as to the need of the country in building up a navy to protect us against the sometime invasion of a foreign foe. Are we consistent in neglecting to consider the necessity for protection against an ever-present foe within our borders, which is annually killing more people than all our wars of recent years and destroying property values equivalent to the price of a fairly large new navy every year?

Secretary Merrill further calls attention to the general unsafe conditions and the large number of fires due to carelessness. He concludes by describing the organization and methods of the Underwriters' Laboratories, referring to the work of our Association, the National Board of Fire Underwriters, and other organizations all working together in an attempt to reduce the fire waste.

Albert Blauvelt, a member of our Executive Committee, read a very interesting paper on Factory Fire Insurance before the Columbus Convention of the National Implement Dealers. The value of proper interior fire protection was emphasized as well as the advantages of good construction and proper supervision.

Dangers and Chemistry of Fire. A law has recently been passed in the State of Ohio which provides for the instruction of school children in dangers of fire. We quote Sections 1 and 2 of this law:

> SECTION 1. It shall be the duty of the principal or other person in charge of every public or private school or educational institution within the state, having an

average daily attendance of fifty or more pupils, to instruct and train the pupils by means of drills, so that they may in sudden emergency be able to leave the school building in the shortest possible time and without confusion or panic. Such drills or rapid dismissals shall be held at least once each month when said schools are in session and all doors of exit shall be kept unlocked during school hours.

That every teacher or instructor in every public, private or parochial school shall devote not less than thirty minutes in each month during which the school is in session, to instruction of pupils between the ages of six and fourteen years, in fire dangers.

For the purpose of such instruction it shall be the duty of the state fire marshal to prepare a book conveniently arranged in chapters, or lessons, such chapters or lessons to be in number sufficient to provide a different chapter or lesson for each week of the maximum school year, one of such lessons to be read by the teachers in such schools each week. The books shall be published at the expense of the state, under the direction of the school commissioner and shall be distributed in quantities sufficient to provide a copy for each teacher required by the provisions of this act to give the instruction herein provided for; the distribution to be made by the state school commissioner.

SECTION 2. Willful neglect by any principal or other person in charge of any public or private school or educational institution to comply with the provision of this act, shall be a misdemeanor, punishable, each offense, by a fine of not more than twenty nor less than five dollars.

In compliance therewith the State Fire Marshal prepared two pamphlets or text-books on the Dangers and Chemistry of Fire, one for primary schools and one for grammar schools, both books being of similar size but the latter being somewhat more complete. There are 16 lessons in all as follows: Lesson No. 1, Carelessness with Matches; No. 2, The Safety Match; No. 3, Death from Playing with Matches; No. 4, The Coal-Oil or Kerosene Lamp; No. 5, Kindling a Fire; No. 6, Stoves for Cooking and Heating; No. 7, Open Fireplaces and Grates; No. 8, Fires from Chimneys; No. 9, Stovepipes and Smoke; No. 10, Sparks Start Many Fires; No. 11, The Ash Heap and the Coal Pile; No. 12, Dangers from Leaking Gas; No. 13, Gas Lights; No. 14, The District Schoolhouse; No. 15, The Danger from Christmas Trees; No. 16, Fire Danger from Grease and Oil.

We believe this is a move in the right direction and it appears entirely logical to begin with the children if we expect future generations to take greater interest in fire dangers.

Ignorance and carelessness are responsible for much of the fire waste and a proper understanding of the dangers which exist and a realization of the consequences which follow will go a long way towards improving conditions.

Secretary's Report, Branch Offices, and Underwriters' Laboratories.

SECRETARY'S REPORT.

The past quarter shows a desirable addition to our list of Active Members as follows:

The National Association of Local Fire Insurance Agents.

State Fire Marshals' Association of America.

The National Association of Manufacturers of the United States of America.

Ohio State Fire Prevention Association.

In response to a request addressed the President by our Active Member, the American Institute of Electrical Engineers, the Executive Committee has appointed a special committee to confer with the Electrical Code Committee of the Institute on the subject of underground water mains and pipe with especial reference to the electrical connection of transformer secondaries thereto.

The Committee is made up as follows:

MR. RALPH SWEETLAND, Chairman.

Mr. F. E. Cabot,	Mr. C. A. Hague,
Mr. E. V. French,	Mr. G. E. Bruen.

The resignation of Mr. Henry A. Fiske as a member of the Committee on Devices and Materials was reluctantly accepted by the Executive Committee, effective January 2. Mr. J. C. Richters, Manager, Engineering Department, Middle States Inspection Bureau, New York, N. Y., has been appointed to fill the vacancy.

Following Mr. Fiske's resignation as a member of the Committee on Devices and Materials he has been appointed a member of the Committee on Concrete and Reinforced Concrete for Building Construction and a member of the Committee on Fireproof Construction.

The publicity work authorized by the Executive Committee to be undertaken under the direction of the President, Mr. C. M. Goddard, having shown gratifying results in a restricted field during the closing months of the year is now being extended. The statistical and literary matter has been prepared largely by Mr. Franklin H. Wentworth acting under instructions from the President.

The next meeting of the Executive Committee is called to be held in Chicago on Wednesday, February 24.

The regular quarterly meeting of the Device and Material Committee is called to be held in Chicago Thursday, February 25.

An index to the printed records of the Association ordered prepared by the Executive Committee at a recent meeting will be mailed members through the Secretary's office this month. Extra copies will be supplied members on request without charge for distribution to prospective members and others interested in the work.

LIST OF MEMBERS ELECTED BY THE EXECUTIVE COMMITTEE SINCE LAST AUGUST.

SEPTEMBER, 1908.

ACTIVE.

The National Association of Local Fire Insurance Agents, Mr. Henry H. Putnam, Secretary, 159 Devonshire Street, Boston, Mass.

ASSOCIATE.

Mr. A. H. Apperson, Electrician, South-Eastern Underwriters' Association, Box 778, Richmond, Va.
Mr. F. K. Foster, Manager of Divisions, British Northwestern Fire Insurance Company, 317 Portage Avenue, Winnipeg, Manitoba, Canada.
Mr. James R. Parker, Special Agent for North Carolina, Home Insurance Company, P. O. Drawer 210, Columbia, S. C.
Mr. Robert Scott, Superintendent Insurance Department, Atlantic Coast Line Railroad Company, Wilmington, N. C.

SUBSCRIBING.

Mr. George B. Allen, Mill Architect and Civil Engineer, 686 Main Street, Hartford, Conn.
Mr. R. E. Miller, Secretary, W. E. Caldwell Company, Brook and D Streets, Louisville, Ky.
The Payson Manufacturing Company, Ventilation Devices, 1319 Jackson Boulevard, Chicago, Ill.
Mr. Geo. W. Ryan, Secretary, Standard Manufacturing Company, P. O. Box 1757, Pittsburg, Pa.

OCTOBER, 1908.

ACTIVE.

State Fire Marshals' Association of America, Mr. W. S. Rogers, Secretary-Treasurer, Columbus, Ohio.

ASSOCIATE.

Mr. Frederick L. Holman, Special Agent, Underwriters' Association of the Middle Department, 316 Walnut Street, Philadelphia, Pa.
Mr. Harry L. Keefe, Secretary of the American Association of Mutual Insurance Companies, Walt Hill, Neb.
Mr. John S. Luce, R. W. Luce & Son, Insurance, P. O. Box 505, Scranton, Pa.
Mr. L. Weismiller, Managing Director, The London Mutual Fire Insurance Company, 82 and 84 King Street, East Toronto, Ontario.
Mr. D. E. Witt, Special Agent, Germania Fire Insurance Company, P. O. Box 78, Lynchburg, Va.

SUBSCRIBING.

Mr. Frank Lyman Austin, Architect, Burlington, Vt.
Mr. Gair Tourtellot, Manager, Tubular Rivet & Stud Company, 231 East Lake Street, Chicago, Ill.
Mr. H. M. Wilson, Chief Engineer, Technologic Branch, United States Geological Survey, Washington, D. C.

NOVEMBER, 1908.

ASSOCIATE.

Mr. W. H. Carpenter, Carpenter & Rowland, 529 Main Street, Racine, Wis.
Mr. Fred R. Davis, Inspector, Associated Factory Mutual Fire Insurance Companies, 1515 Arch Street, Philadelphia, Pa.
Mr. P. L. Handy, Inspector with Underwriters' Bureau of New England, 93 Water Street, Boston, Mass.
Mr. Harold G. Howe, Inspector, Commercial Union Assurance Company, Limited, 58 William Street, New York City.
Mr. Hugh R. Smith, Underwriters' Bureau of Middle and Southern States, 72 William Street, New York City.
Mr. James W. Smith, Inspector, Underwriters' Bureau of New England, 93 Water Street, Boston, Mass.
Mr. Colin E. Sword, Fire Insurance Manager, Quebec Fire Assurance Company, 81 St. Peter Street, Quebec, P. Q., Canada.
Mr. Lloyd Vosseller, Fire Insurance, 459 Cedar Street, New York City.

SUBSCRIBING.

Mr. Charles B. Dudley, Chemist Pennsylvania Railroad Company, Drawer 156 Altoona, Penn.

APPROVED DEVICES AND MATERIALS.

By direction of the Executive Committee (action November, 1907) we list below in form convenient for reference by members the names and addresses of manufacturers of devices and materials which have thus far been favorably passed upon by the Committee of Devices and Materials, following examinations, tests and recommendations made by Underwriters' Laboratories, Inc.

The Laboratories have also issued reports giving ratings unfavorable to a large number of appliances. A summary of the findings in each case can be obtained by addressing the Laboratories and any Active or Associate member can receive regularly the cards issued by the Laboratories giving summaries of the results obtained in the current work in all of its departments upon payment of the subscription price of fifteen dollars ($15) per year.

In the lists which follow members should note particularly that in those industries to which the label service has been extended (indicating inspection of goods by Laboratories' engineers at factories before shipment) that **only such of the product of these factories as bear the labels referred to** are covered by the endorsement of our Committee.

BUILDING MATERIAL.

Post Cap and Girder Support (Steel and Malleable Iron).

Caps inspected at factory bear labels attached to an exposed side reading as follows: *(See Cut No. 1.)*

The following company is equipped to supply these devices:

Chicago, A. M. Castle & Co., 55 N. Jefferson Street.

CARBONIC ACID GAS HAND FIRE EXTINGUISHERS, 3 Gallons.

Carbonic Acid Gas Hand Fire Extinguishers shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with requirements of the National Fire Protection Association and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by metal labels soldered to the front of the cylinders reading: *(See Cut No. 2.)*

The following companies are equipped to supply these devices:

Boston, Badger Fire Extinguisher Co., 32 Portland Street.
Boston, Knight & Thomas, Inc., 99 State Street.
Buffalo, Western Inspection Co., 45 N. Division Street.
Chicago, Miller Chemical Engine Co., 149 E. Huron Street.
Chicago, Staff Fire Extinguisher Co., 73 E. Erie Street.
Cincinnati, Harker Mfg. Co., 118 W. Second Street.
Columbus, Seagrave Company, South High Street.
Elmira, N. Y., American-LaFrance Fire Engine Co.
Montreal, Can., The Garth Co., 26-32 Craig Street.
Newark, N. J., The Tea Tray Company of Newark, N. J., Mulberry and Murray Streets.
Petrolia, Ont., Canada, Stempel Mfg. Co.
Philadelphia, James Boyd & Bro., 14 North Fourth Street.
Philadelphia, National Inspection Co., 418-422 Sansom Street.
Pittsburg, Fire Extinguisher & Supply Co., 1414-1422 Spring Garden Avenue, N. S.
Pittsburg, Pittsburg Lamp, Brass & Glass Co.
Racine, Wis., Racine Iron & Wire Works, 1022 Douglas Avenue.
St. Louis, Frank & St. Gemme Mfg. Co., 815-817 Market Street.
St. Louis, Missouri Lamp and Mfg. Co., 116 Elm Street.
St. Louis, Stempel Fire Extinguisher Co., 4250 North 20th Street.
Toronto, Canada. Victor Fire Extinguisher Company, 704 Continental Life Building.
Utica, O. J. Childs Co., 50 Liberty Street.

CARBONIC ACID GAS FIRE EXTINGUISHERS, 40 Gallons.

Carbonic Acid Gas Fire Extinguishers of 40 gallon capacity mounted on wheels, shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by metal labels soldered to the front of the cylinder reading: *(See Cut No. 3.)*

The following company is equipped to supply these devices:

Boston, Badger Fire Extinguisher Co., 32 Portland Street.

DOORS.

N. F. P. A. Standard 2½ inch tin-clad.

Doors of this class shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by stampings in the tin plates or by attaching brass labels reading: *(See Cut No. 4.)*

The following companies are equipped to supply these devices:

Akron, The Kasch Roofing Co., 16-24 Canal Street.
Buffalo, Chas. Bauers' Sons, 159 William Street.
Buffalo, Dusing & Hunt, 70 Main Street.
Buffalo, Machwirth Bros. Co., 201-209 Oak Street.
Buffalo, G. H. Peters & Co., 289-293 Oak Street.
Chicago, J. L. Lyon, 62-64 North Jefferson Street.
Chicago, J. C. McFarland & Co., 27th Street and Fifth Avenue.

Chicago, Variety Mfg. Co., Carroll and Sacramento Avenues.
Cleveland, J. Callaghan & Son, 1119 Superior Avenue, near Twelfth Street, N. E.
Cleveland, Cleveland Metal Roofing & Ceiling Co., 3103-3105 Detroit Avenue.
Cleveland, Cleveland Sheet Metal Works, 6933-5 Superior Avenue.
Cleveland, The O'Donnell Safety System Co., 3062 Superior Avenue, N. E.
Cleveland, The Ohio Roofing Co., 1477 Euclid Avenue.
Cleveland, Riester & Thesmacher Co., 325-329 Pearl Street.
Kansas City, Geo. W. Johnson Mfg. Co., 209-11 W. 17th Street.
Milwaukee, Consolidated Sheet Metal Works, 661-673 Hubbard Street.
Minneapolis, Stremel Bros. Roofing & Cornice Co., 1215-1219 Washington Avenue, North.
Newburyport, Victor Manufacturing Co.
New Orleans, American Sheet Metal Works, Carrollton Avenue and Edinburgh Street.
New Orleans, Estate of R. G. Holtzer, 317-323 Burgundy Street.
New Orleans, A. J. Nelson Manufacturing Co., Ltd.
New Orleans, New Orleans Roofing and Metal Works, Scott, Toulouse, St. Louis Streets and Carrollton Avenue.
New York, Howell & Lawrence, 1788 First Avenue.
New York, Manhattan Fire-Proof Door Co., 412-422 E. 125th Street.
New York, John W. Rapp, 1 Madison Avenue.
New York, M. F. Westergren, Inc., 213-221 E. 144th Street.
Richmond, Ind., Richmond Safety Gate Co.
San Francisco, Rulofson Metal Window Works, 315-319 Monadnock Building.
St. Louis, Albert & Fischer Hardware & Sheet Metal Co., 2529 South Broadway.
St. Louis, Caplan Galvanized Iron Cornice Co., 4412-4414 Easton Avenue.
St. Louis, J. Eberle & Son, 2014-2016 Laclede Avenue.
St. Louis, Gerock Bros. Mfg. Co., 1352 Old Manchester Road.
St. Louis, O. K. Harry Steel Works, 2333-5 Papin Street.
St. Louis, Frank B. Higgins, 924 North Sixth Street.
St. Louis, Hopman Cornice Co., 2500-2 North Jefferson Street.
St. Louis, Mesker & Bro., 421-519 S. Sixth Street.
St. Louis, Missouri Fire Door Co., 100 South Commercial Street.
St. Louis, E. Murphy & Co., 3727-3731 Easton Avenue.
St. Louis, Powers & Boyd Cornice and Roofing Co., 3614-16 Laclede Avenue.
St. Louis, Richmond Safety Gate Co., 1117 Chemical Building.
St. Louis, Ruth Cornice Co., 4299 Easton Avenue.
St. Louis, St. Louis Fire Door Co., Cass and Collins Streets.
St. Louis, E. E. Souther Iron Co., 2206 North Second Street.
St. Louis, Standard Fire Door and Contracting Co., 3025 Texas Avenue.
St. Louis, Van der Au & Cluss Mfg. Co., 2408 Jefferson Avenue.
St. Louis, Wand & Niehaus, 3008 Kossuth Avenue.
St. Louis, West End Cornice Works, 4740 Delmar Avenue.
Toronto, Ont., Canada, A. B. Ormsby, Ltd., 161-165 E. Queen Street.

Door and Shutter, Metal.

Doors of this class which are considered to be the equivalent of the N. F. P. A. Standard 2½ inch tin-clad door for openings not exceeding 72 inches in width, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels riveted to the door reading as follows: *(See Cut No. 4.)*

The following company is equipped to supply these devices:

Memphis, Tenn., Saino Fire Door and Shutter Co., 538 Lucy Avenue.

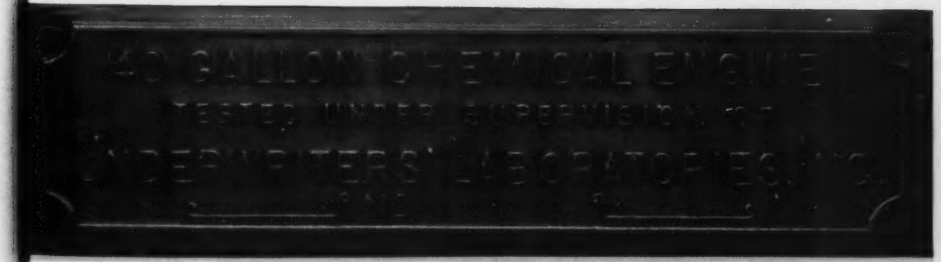
Door and Shutter, Rolling.

Doors of this class (for openings not exceeding 8 feet wide and 9 feet high, where standard fire doors cannot be employed), shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels attached to bottom bar reading: *(See Cut No. 5.)*

APPROVED DEVICES AND MATERIALS
LABEL SERVICE.

Cut No. 1.

Cut No. 2.



Cut No. 3.

Cut No. 4.

Cut No. 5.

Cut No. 9.

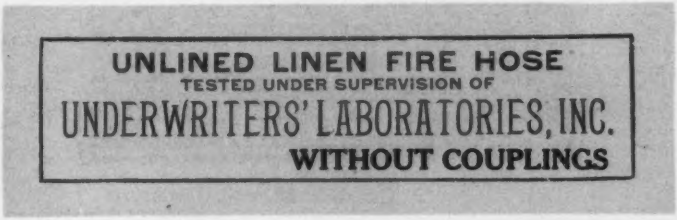
Cut No. 10.

Cut No. 6.

Cut No. 8.

Cut No. 7.

Cut No. 11.



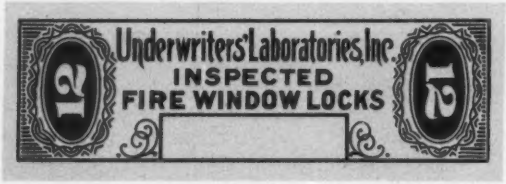
Cut No. 12.

Cut No. 13.

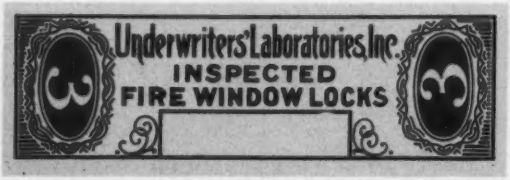
Cut No. 14.

Cut No. 15.

Cut No. 16.



Cut No. 17.



Cut No. 18.

The following company is equipped to supply these devices:

Columbus, O., The Kinnear Mfg. Co.

Corridor or Partition Doors. (Not for openings in fire walls.)

Doors of this class shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels screwed or riveted to the edge of the door reading: *(See Cut No. 6.)*

The following companies are equipped to supply these devices:

Chicago, Knisely Bros., Fifth Avenue and 28th Place.
Chicago, Voigtmann & Co., 42-54 East Erie Street.
Jamestown, N. Y., American Metal Door Co.
Jamestown, N. Y., Dahlstrom Metallic Door Co.
Jamestown, N. Y. General Fireproofing Co.
Minneapolis, Minn., Northwestern Roofing, Cornice and Stamping Works, 113 S. Fifth Street.
Minneapolis, Minn. Thorp Fireproof Door Co., 1600-1616 Central Avenue.
New York, J. F. Blanchard Co., Broadway and 23d Street.
New York, Howell & Lawrence, 1788 First Avenue.
New York, Manhattan Fire Proof Door Co., 412-422 E. 125th Street.

Stair or Elevator Doors. (Not for openings in fire walls.)

Doors of this class shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels screwed or riveted to the edge of the door reading: *(See Cut No. 7.)*

The following companies are equipped to supply these devices:

Chicago, Variety Mfg. Co.
Columbus, O., The Kinnear Mfg. Co.
Jamestown, N. Y., American Metal Door Co.
Jamestown, N. Y., Dahlstrom Metallic Door Co.
Minneapolis, Northwestern Roofing, Cornice and Stamping Works, 1113 S. Fifth Street.
Minneapolis, Thorp Fireproof Door Co., 1600-1616 Central Avenue.
New York, J. F. Blanchard Co., Broadway and 23d Street.
New York, Howell & Lawrence, 1788 First Avenue.
New York, Manhattan Fire Proof Door Co., 412-422 E. 125th Street.
Youngstown, General Fireproofing Co.

DOOR AND SHUTTER HARDWARE.

3½ x ⅜ Hardware for Sliding Doors only.

Hardware of this class shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels applied to each hanger, binder and stay roll of each set reading: *(See Cut No. 8.)*

A tag is also attached to one hanger of each set on which is printed a list of the pieces which a complete set should contain, as follows:

1. **One 3½x⅜ inch track, length to be equal to twice the width of door opening plus 21 inches. Punched for wall bolts.**
2. **Two hangers for openings 6 feet and less in width, three hangers for openings wider than 6 feet. Bolts for attaching hangers to door.**

3. Two 3½x⅜ inch binders.
4. One 2x½ inch stay roll.

Stay roll should be the type specified for the form of sill used, and should include all bolts except wall bolts.

5. One cast iron bracket for each track bolt.
6. Two ¾x¼ inch half oval chafing strips for back of door, two 1x⅛ inch flat strips for front of door opposite the oval strips. Bolts for fastening above strips together through door. Length of above strips to be 4 inches less than door opening.
7. One 1½x⅛ inch strip 5 inches less than width of door to take wear of stay roll. Wood screws for attaching.
8. One wedge with screws for attaching.
9. One bow shaped handle and one flush pull with bolts and screws for attaching.
10. One front bumper and one back bumper.
11. Four bumper shoes and screws for attaching.
12. One washer for each wall bolt, including those for binders and stay roll.
13. One instruction card for mounting.

Where the hardware for a single fire door on each side of the fire wall is bolted together through the wall, the washers above specified are unnecessary.

Wall bolts are not included as the requirements for length varies in each case. Automatic attachments are not as yet included in a standard set of hardware.

UNDERWRITERS' LABORATORIES, Inc.,
382 Ohio St., Chicago.

The following companies are equipped to supply these devices:

Aurora, Ill., The Richards Mfg. Co.
Aurora, Ill., Wilcox Mfg. Co.
Holyoke, Mass., Coburn Trolley Track Mfg. Co.
Newburyport, Mass., Victor Manufacturing Co.
New York, The McCabe Hanger Mfg. Co., 425-27 W. 25th Street.
Philadelphia, James Peters & Sons, 1934-38 North Front Street.
Richmond, Ind., Richmond Safety Gate Co.
South Milwaukee, Wis., Stowell Mfg. & Foundry Co.

Specially Designed, Malleable Iron Hardware for Sliding Door Only.

Hardware of this type shown by tests and examinations conducted by the Underwriters' Laboratories to be the full equivalent of the 3½x⅜ hardware made in accordance with requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels attached to each hanger, binder and stay roll of each set reading: *(See Cut No. 8.)*

A tag is also attached to one hanger of each set on which is printed a list of the pieces which a complete set should contain, as follows:

1. One 1 7-16 inch tubular track, length to be equal to twice the width of the door opening, plus 14 inches.
2. Two hangers for openings six feet and less in width; three hangers for openings wider than six feet. Bolts for attaching hangers to door.
3. Two malleable iron binders.
4. One malleable iron stay roll.
5. Brackets to carry track, including two special end supports.
6. Two ¾x¼ inch half oval chafing strips for back of door, two flat strips for front of door opposite the oval strips. Bolts for fastening above strips together through the door. Length of above strips to be 4 inches less than door opening.

7. One 2¼x⅛ inch strip 5 inches less than width of door to take wear of stay roll. Wood screws for attaching.
8. One steel wedge with screws for attaching.
9. One bow shaped handle and one flush pull with bolts for attaching.
10. One front bumper and one back bumper.
11. Four bumper shoes and screws for attaching.
12. One washer for each wall bolt, including those for binders, bumpers and stay roll.

Where the hardware for a single fire door on each side of the fire wall is bolted together through the wall, the washers above specified are unnecessary.

Wall bolts are not included as the requirements for length vary in each case. Automatic attachments are not as yet included in a standard set of hardware.

UNDERWRITERS' LABORATORIES, Inc.,
382 Ohio St., Chicago.

The following companies are equipped to supply these devices:

Chicago, Allith Manufacturing Co., Taylor Street and 43rd Avenue.
Hamilton, Can., Allith Manufacturing Co.

Specially Designed Malleable Iron Hanger and Brackets, and Tubular Steel Track with 3½x⅜ Inch Hardware.

Hardware of this type consisting of specially designed malleable iron hanger and brackets, and tubular steel track in combination with a complete set of approved 3½x⅜ hardware, shown by tests and examinations conducted by the Underwriters' Laboratories to be the full equivalent of the 3½x⅜ hardware made in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels attached to each hanger, binder and stay roll of each set reading: *(See Cut No. 8.)*

A tag is also attached to one hanger of each set on which is printed a list of the pieces which a complete set should contain, as follows:

1. One 1⅜ inch tubular steel track, length to be equal to twice the width of the door opening, plus 14 inches.
2. Two hangers for openings 6 feet and less in width; three hangers for openings wider than 6 feet. Bolts for attaching hangers to door.
3. Two 3½x⅜ inch binders.
4. One 2x½ inch stay roll.

Stay roll should be the type specified for the form of sill used, and should be provided with all bolts except wall bolts.

5. Malleable iron brackets for carrying tracks, including two special end supports.
6. Two ¾x¼ inch half oval chafing strips for back of door; two flat strips for front of door opposite chafing strips. Bolts for fastening strips together through door. Length of above strips to be 4 inches less than door opening.
7. One 1½x⅛ inch strip 5 inches less than width of door. Wood screws for attaching.
8. One wedge with screws for attaching.
9. One bow shaped handle, and one flush pull with bolts for attaching.
10. One front bumper and one back bumper, identical with and in addition to binders.
11. Four bumper shoes and screws for attaching.
12. One washer for each wall bolt, including those for binders, bumpers and stay roll.
13. One instruction card for mounting.

Where the hardware for a single fire door on each side of the fire wall is bolted together through the wall, the washers above specified are unnecessary.

Wall bolts are not included, as the requirements for length vary in each case. Automatic attachments are not as yet included in a standard set of hardware.

UNDERWRITERS' LABORATORIES, Inc.,
382 Ohio St., Chicago.

The following company is equipped to supply these devices:

Aurora, Ill., Wilcox Manufacturing Co.

Specially Designed Malleable Iron Hangers, with 3½x⅜ Inch Hardware.

Hardware of this type, consisting of specially designed adjustable malleable iron hangers in combination with a complete set of approved 3½x⅜ inch fixtures for sliding doors, examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels attached to each hanger, binder and stay roll of each set, reading: *(See Cut No. 8.)*

A tag is also attached to one hanger of each set on which is printed a list of the pieces which a complete set should contain, as follows:

1. **One 3½x⅜ inch track, length to be equal to twice the width of door opening, plus 21 inches. Punched for wall bolts.**
2. **Two adjustable malleable iron hangers for openings 6 feet and less in width; three hangers for openings wider than 6 feet. Bolts for attaching hangers to door.**
3. **Two 3½x⅜ inch binders.**
4. **One 2x½ inch stay roll.**
5. **One cast iron bracket for each track bolt.**
6. **Two ¾x¼ inch half oval chafing strips for back of door, two flat strips for front of door opposite the oval strips. Bolts for fastening the above strips together through door. Length of above strips to be 4 inches less than door opening.**
7. **One 1½x⅛ inch strip 5 inches less than width of door to take wear of stay roll. Wood screws for attaching.**
8. **One cast iron wedge with screws for attaching.**
9. **One bow shaped handle and one flush pull with bolts for attaching.**
10. **One front bumper and one back bumper.**
11. **Four bumper shoes and screws for attaching.**
12. **One washer for each wall bolt, including those for binders and stay roll.**

Where the hardware for a single fire door on each side of the fire wall is bolted together through the wall, the washers above specified are unnecessary.

Wall bolts are not included as the requirements for length vary in each case. Automatic attachments are not as yet included in a standard set of hardware.

UNDERWRITERS' LABORATORIES, Inc.,
382 Ohio St., Chicago.

Approval of this device is limited to locations where an adjustable hanger is acceptable to Underwriters having jurisdiction.

The following company is equipped to supply these devices:

South Milwaukee, Wis., Stowell Mfg. and Foundry Co.

FIRE DOORS. (See Doors.)

GLASS. (See Wired Glass.)

HARDWARE. (See Door and Shutter Hardware; also Window Hardware.)

HEAT INSULATING COVERINGS.

The following material is approved for heat insulating purposes for walls, floors and ceilings in cold storage warehouses, cold storage cellars in breweries, cold rooms in packing houses, hotel refrigerators, fur storage rooms and rooms of this character.

Cork Board (Nonpareil) laid in cement mortar. Manufactured by Armstrong Cork Co., Pittsburg, Pa.

HOSE.

2½ Inch Cotton Rubber-Lined.

Private Fire Department Hose for outside use shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by red rubber label attached to each 50 foot length **with couplings attached** reading: *(See Cut No. 9.)*

And by slate colored label attached to each 50 foot length **without couplings** reading: *(See Cut No. 10.)*

The following companies are equipped to supply this material:

Akron, O., B. F. Goodrich Co.
Cambridge, Mass., Boston Woven Hose and Rubber Co.
New York, Fabric Fire Hose Co., Corner Duane and Church Streets, Elkshead.
New York, Manhattan Rubber Mfg. Co., 18 Vesey Street.

Before the extension of the label service to this industry approvals were granted to certain brands of hose manufactured by the foregoing and other companies as follows:

Afmic, New York Belting and Packing Co. Ltd., 91 Chambers Street, New York.
American, Boston Belting Co., 256 Devonshire Street, Boston, Mass.
G. P., Gutta Percha and Rubber Mfg. Co., 126 Duane Street, New York.
Guttaperch, Gutta Percha and Rubber Mfg. Co. of Toronto, Ltd., 47 Yonge Street, Toronto, Ont.
Security, Revere Rubber Co., Chelsea, Mass.
Star, Canadian Rubber Co., Notre Dame Street and Papineau Avenue, Montreal, Can.
Tuebor, New Jersey Car Spring and Rubber Co., Wayne and Brunswick Streets, Jersey City, N. J.
2-X-L, Mechanical Rubber Co., Cleveland, O.
U. S., Eureka Fire Hose Mfg. Co., 13 Barclay Street, New York.

Unlined Linen.

Unlined Linen Fire Hose for use inside buildings shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by label attached to each length **with couplings attached** reading as follows: *(See Cut No. 11.)*

And by label attached to each length **without couplings** reading: *(See Cut No. 12.)*

The following companies are equipped to supply this material:

Cambridge, Mass., Boston Woven Hose and Rubber Co.
Malden, Mass., Chas. Niedner's Sons Co., 10-20 James Street.
New York, Eureka Fire Hose Mfg. Co., 13 Barclay Street.

HYDRANTS.

The hydrant manufactured by the following company has been examined and tested and pending the adoption of revised specifications for construction of devices of this class is recommended for use in connection with mill yard and other private underground fire mains. Service record generally satisfactory.

Indian Orchard, Mass. Chapman Valve Mfg. Co.

PAINTS, FIRE RETARDANT.

The so-called "cold water" paints listed below have been examined and tested.

These coatings for wood and other similarly combustible building materials which come under this class, or property so coated, should in no sense be considered as "fire-proof." Their use is preferable to leaving the material uncoated because they retard the spread of fire over combustible surfaces and are particularly desirable in lieu of varnish, shellac, or oil finish, which latter serve to rapidly spread fire. Attention is called, however, to the need of renewal of the coatings in order to maintain the desired conditions.

Whitewash so well meets the requirements of this class that we print formula recommended by the Lighthouse Board of the United States Treasury Department as follows:

"Slake one-half bushel of unslaked lime with boiling water, keeping it covered during the process; strain it and add a peck of salt dissolved in warm water; three pounds of ground rice, put in boiling water and boil to a thin paste; one-half pound powdered Spanish whiting and a pound of clear glue dissolved in hot water; mix these well together and let the mixture stand for several days. Keep the wash thus prepared in a kettle or portable furnace, and when used put it on as hot as possible with painter's or whitewash brushes."

Where possible the coatings should be applied by a hand brush rather than by a spraying machine, thus effecting a better surface, and special care should be exercised not to coat sprinkler heads where installed.

Asbestine. Manufactured by The Muralo Co., New Brighton, S. I., N. Y.
Carey's. Manufactured by The Neptune Paint Co., Hudson, Mich., for The Philip Carey Mfg. Co., Cincinnati, O.
Decorine. Manufactured by Benj. Moore & Co., 111 N. Green Street, Chicago.
Hygienic Fireproof Calcimine. Manufactured by The Rubber Paint Co., 154 W. Van Buren Street, Chicago.
Indeliblo. Manufactured by The Muralo Co., New Brighton, S. I., N. Y.
Indurine. Manufactured by The Muralo Co., New Brighton, S. I., N. Y.
J. M. Manufactured by The Neptune Paint Co., Hudson, Mich, for H. W. Johns-Manville Co., Milwaukee, Wis.
K'Sene. Manufactured by The Muralo Co., New Brighton, S. I., N. Y., for Western Roofing and Supply Co., Chicago.
Monarch. Manufactured by Geo. Fletcher & Co., 49-51 N. Ashland Avenue, Chicago.
Nepolite. Manufactured by The Neptune Paint Co., Hudson, Mich.
Retardo. Manufactured by Benj. Moore & Co., Chicago, for Retardo Fire Proof Paint Co., Milwaukee, Wis.

PLAY PIPE.

The National Standard Play Pipe for 2½ inch hose manufactured by the following manufacturer has been examined and tested and approved for use:

New York, Eureka Fire Hose Manufacturing Co.

ROOFINGS.

Certain proprietary roofings listed below have been examined and tested.

These tests indicate that the fire retardant properties of these materials are inferior to those of slate, metal or good tin-clad roofs, but in a class with those of good slag and good gravel roofs, and superior to those of wooden shingle roofs.

Arrow Brand Asphalt Ready Roofing (Prepared, 2 ply), Asphalt Ready Roofing Co., 136 Water Street, New York.

Amatite (Prepared), Barrett Manufacturing Co., 17 Battery Place, N. Y.

Amazon Ready Roofing, (Prepared, 2 and 3 ply), Barrett Mfg. Co., Philadelphia, Pa.

Becker Asphaltum Ready Roofing, (Prepared, 2 and 3 ply), F. Becker Asphaltum Ready Roofing Co., 1510-12 Milwaukee Avenue, Chicago, Ill.

Black Diamond, (Prepared, 2 and 3 ply), Barrett Mfg. Co., 17 Battery Place, N. Y.

Carbonite (Prepared, 2 and 3 ply), The Heppes Co., 2427 Fillmore Street, Chicago.

Carey's Standard Magnesia Flexible Cement (Prepared), The Philip Carey Mfg. Co., Lockland, Cincinnati, O.

Climax Asphalt, (Prepared, 2 and 3 ply), McHenry-Millhouse Mfg. Co., South Bend, Ind.

Congo (Prepared, 2 and 3 ply), The Buchanan-Foster Co., 504 West End Trust Bldg., Philadelphia, Pa.

Eclipse Rubber (Prepared), Ford Manufacturing Co., Washington and Desplaines Street, Chicago, Ill.

Ehrets (Slag), Warren-Ehret Co., 1202 Land Title Bldg., Philadelphia.

Elaborated Ready (Prepared), Elaborated Ready Roofing Co., 4419 La Salle Street, Chicago.

Elaterite (Prepared), Western Elaterite Roofing Co., 841-4 Equitable Building, Denver, Col.

Flexo (Prepared, 2 and 3 ply), The Heppes Co., 2427 Fillmore Street, Chicago

Galvanized Rubber (Prepared), Ford Manufacturing Co., Washington and Desplaines Streets, Chicago, Ill.

Genasco Asphalt Composition (4 ply), Barber Asphalt Paving Co., Philadelphia, Pa., for the Genasco Roofing Co., Chicago.

Genasco (Prepared, Smooth Surface, 2 and 3 ply, Stone Surface, Whitestone and Model, 2 ply), The Barber Asphalt Paving Co., Philadelphia, Pa.

Granite (Prepared), The Eastern Granite Roofing Co., 1 Hudson Street, New York, N. Y.

Huttig Rubber (Prepared, 2 and 3 ply), Barber Asphalt Paving Co., 1243 Stock Exchange Bldg., Chicago, for Huttig Mfg. Co., Muscatine, Iowa.

Indruroid (Prepared, 2 and 3 ply), H. F. Watson Co., Erie, Pa.

Malthoid (Prepared, 2 and 3 ply), The Paraffine Paint Co., Merchants Exchange Bldg., San Francisco, Cal.

Mastic (Prepared), National Mastic Roofing Co., San Francisco, and National Roofings and Materials Co., Edwardsville, Ill.

Mikado (Prepared, 2 and 3 ply), J. A. & W. Bird & Co., 35 India Street, Boston.

Monarch (Prepared, 2 and 3 ply), Stowell Mfg. Co., Jersey City, N. J.

No-Tar (Prepared, 2 and 3 ply), The Heppes Co., 2427 Fillmore Street, Chicago.

Paroid (Prepared, 2 and 3 ply), F. W. Bird & Son, East Walpole, Mass.

Protection Brand Asphalt Ready Roofing (Prepared), Asphalt Ready Roofing Co., 136 Water Street, New York.

Rex Flintkote (Prepared, 2 and 3 ply), J. A. & W. Bird & Co., 35 India Street, Boston.

Rhinoceros (Prepared, 2 and 3 ply), Warren Chemical and Manufacturing Co., 17 Battery Place, New York.

Roofbestos (Prepared, 2 and 3 ply), Roofbestos Mfg. Co., St. Louis, Mo.

Roofrite (Prepared), The Lehon Co., W. 43rd Street, Lincoln to Robey, Chicago.

Rubber (Prepared, 2 and 3 ply), The General Roofing Co., East St. Louis, Ill.

Rubbertex (Prepared, 2 and 3 ply), The Heppes Co., 2427 Fillmore Street, Chicago.
Ruberoid (Prepared, 2 and 3 ply), Standard Paint Co., 100 William Street, New York.
Russelloid (Prepared, 2 and 3 ply), Russell & Dexter Co., Penn Yan, N. Y.
Safety (Prepared), National Roofing Co., Tonawanda, N. Y.
Security (Prepared), National Roofing Co., Tonawanda, N. Y.
Seneca (Prepared, 2 and 3 ply), Russell & Dexter Co., Penn Yan, N. Y.
Standard Asbestos (Prepared), H. W. Johns-Manville Co., 100 William Street, New York.
Stowell's Slag (Slag), Stowell Mfg. Co., Jersey City, N. J.
Veribest Rubber (Prepared, 2 and 3 ply), McHenry-Millhouse Mfg. Co., South Bend, Ind.
Vulcanite (Prepared, 2 and 3 ply), The Patent Vulcanite Roofing Co., 625 S. Campbell Avenue, Chicago.
Walrus (Prepared, 2 and 3 ply), Warren Chemical and Manufacturing Co., 17 Battery Place, New York.
West Coast Ready Rock (Prepared), The West Coast Company, Waukegan, Ill.

SASH CHAIN. (See Window Hardware.)

SASH LOCK. (See Window Hardware.)

SHUTTERS. (See Doors.)

SPRINKLERS, Automatic.

It has not been judged necessary as yet to extend label service to these devices.

The following patterns are approved:

Grinnell Improved 1903. General Fire Extinguisher Co., Providence, R. I.
International, Evans 1902 Model. International Sprinkler Co., 517 Arch Street, Philadelphia, Pa.
Manufacturers "C." Manufacturers' Automatic Sprinkler Co., 1-11 Liberty Street, New York.
Neracher Improved 1902. General Fire Extinguisher Co., Providence, R. I.
Niagara-Hibbard, issue B, 1904. Niagara Fire Extinguisher Co., Akron, O.
Phoenix, issue A, 1905. Phoenix Fire Extinguisher Co., 1028-33 First National Bank Bldg., Chicago.
Rockwood, issue A. Worcester Fire Extinguisher Co., 4 Arch Street, Worcester, Mass.

SPRINKLER SUPERVISORY DEVICES.

For use in connection with approved central station systems.

Consists of apparatus for transmitting signals when gate valves are closed or open; when water in tanks falls below or is restored to predetermined level; when pressure in air tanks falls below or is restored to predetermined amount; when water in tanks falls below or rises above predetermined temperatures. Also apparatus for connection with water flow valves to transmit water flow signals (where there is a flow of water equal to that of one or more sprinklers) and to withhold signals from water surges or variable pressure.

A. D. T. Devices for attaching to Central Station Signaling Systems for supervisory maintenance and operation of sprinkler equipments. Manufactured by Automatic Fire Protection Company, New York and Chicago.

VALVES, ALARM. (See also Sprinkler Supervisory Devices.)

No appliances meeting all of the requirements desirable for this service have as yet been shown.

Ratings covering the patterns found in common use have been issued as follows:

Evans Variable Pressure 1902 model. Manufactured by International Sprinkler Co., 517 Arch Street, Philadelphia. Not standard. Field experience limited, but fairly satisfactory where device has been properly installed, correctly adjusted and intelligently supervised.

Grinnell English Pattern, Variable Pressure (Swing check for Straightway type). Manufactured by General Fire Extinguisher Co., Providence, R. I. Not standard. Field experience fairly satisfactory where device has been properly installed, correctly adjusted and intelligently supervised.

Grinnell branch (old type called Harkness Tee). Manufactured by General Fire Extinguisher Co., Providence, R. I. Not standard. Field experience, where central station and Local Board supervision obtains and valves are under constant pressure, reported as fairly satisfactory.

Manufacturers. Manufactured by Manufacturers Automatic Sprinkler Co., 1-11 Liberty Street, New York. Not standard. Field experience with an improved type of this valve in one locality, where central station and Local Board supervision obtains and valves are under constant pressure, reported as fairly satisfactory.

Niagara. Manufactured by Niagara Fire Extinguisher Co., Akron, O. Not standard. Field experience with an improved type of this valve in one locality, where central station and Local Board supervision obtains and valves are under constant pressure, reported as fairly satisfactory.

VALVES, DRY PIPE.

The following dry pipe valves are approved for use:

Grinnell Straightway. The General Fire Extinguisher Company, Providence, R. I.

International (No. 4 Evans Model), 4-inch size. International Sprinkler Co., Philadelphia, Pa.

Manufacturers, Model 3, 4-inch size. Manufacturers Automatic Sprinkler Co., New York, N. Y.

Phoenix Mechanical, 5-inch size. Phoenix Fire Extinguisher Co., Chicago, Ill.

Rockwood, 4-inch and 6-inch sizes. Worcester Fire Extinguisher Co., Worcester, Mass.

WATCHMEN'S TIME RECORDING APPARATUS.

Boxes for Central Station Systems.

Combined Watchmen's Call and Fire Alarm Boxes for use in connection with approved normally closed circuit Central Station Watchmen's Time Recording Apparatus shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels fixed to the outside of the clock cases reading: *(See Cut No. 13.)*

The following companies are equipped to supply these devises:

American District Telegraph Co., 195 Broadway, New York.
Chicago Electric Protective Co., 147 Fifth Avenue, Chicago.
Signalphone Co., Milwaukee, Wis.
Viaduct Electric Co., 10 S. Howard Street, Baltimore, Md.
Williams Watchman's Clock Co., 608 Washington Loan and Trust Building, Washington, D. C.

Apparatus for Local or Private Systems.

Watchmen's Stationary Clocks shown by tests and examinations conducted by Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by label fixed to outside of clock cases reading: *(See Cut No. 14.)*

and a decalcomania transfer is applied to the outside of the magneto cases reading: *(See Cut No. 15.)*

The following companies are equipped to supply these devices:

American Watchman's Time Detectors Co., 2069 Fourth Street, Cleveland, O.
American Watchman's Time Detectors Co., 234-5 Broadway, New York.
Eco Magneto Clock Co., 289 Congress Street, Boston.
E. A. Hamilton & Co., Grand Rapids, Mich.
E. O. Hausberg, 45 Maiden Lane, New York, N. Y.
Holtzer-Cabot Electric Co., Brookline, Boston, Mass.
E. Howard Clock Co., 373 Washington Street, Boston, Mass.
Newman Clock Co., (Single Station Clock), 1526 Wabash Avenue, Chicago.
Simplex Time Recorder Co., Gardner, Mass.
Standard Watchman's Time Detector Co., (W. Romaine), 1-3 W. Broadway, New York.

Before the extension of the label service to this industry approvals were granted to certain clocks manufactured by the foregoing and other companies as follows:

Indianapolis Magneto. Indianapolis Watchman Clock Co., Indianapolis, Ind.
Wakeman's Single Station. Wakeman's Time Recorder Co., Scranton, Pa.

Portable Clocks.

Watchman's Portable Clocks shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels fixed to the inside of clock cases reading: *(See Cut No. 14.)*

and a decalcomania transfer is applied to outside of the key boxes reading: *(See Cut No. 15.)*

The following companies are equipped to supply these devices:

Eco Magneto Clock Co., 289 Congress Street, Boston.
Hardinge Bros., 1034-1036 Lincoln Avenue, Chicago.
E. O. Hausburg, 45 Maiden Lane, New York.
Nanz Clock Co., 178 Fulton Street, New York.
Newman Clock Co., 1526 Wabash Avenue, Chicago.
The Timekeeper Co., Chicago.

Before the extension of the label service to this industry approvals were granted to certain clocks manufactured by the foregoing and one other company as follows:

New York. Manufactured by J. Schlenker, Germany, for The General Watchman's Time Detectors Co., New York.

WINDOWS.

Metallic Window Frames and Sash glazed with Wired Glass shown by tests and examinations conducted by the Underwriters' Laboratories to be in accordance with the requirements of the National Fire Protection Association, and examined at factories and passed by Underwriters' Laboratories, Inc., can be distinguished by labels riveted to the inside of the window reading: *(See Cut No. 16.)*

The following companies are equipped to supply these devices:

Allegheny, Allegheny Cornice & Skylight Co., 821 Bouquet Street. Double Hung.
Allegheny, Thos. W. Irwin Mfg. Co., 401-411 Rebecca Street. Double Hung.
Boston, E. B. Badger & Sons Co., 63 Pitts Street. Double Hung, Stationary.
Brooklyn, Herrmann & Grace, 671-685 Bergen Street. Pivoted Upper Sash.
Chicago, Grace Cornice Works, 1260 Indiana Avenue. Double Hung.

Chicago, Illinois Roofing & Cornice Co., 329 W. Kinzie Street. Double Hung, Pivoted Upper Sash.

Chicago, Knisely Bros., Fifth Avenue and 28th Place. Casement, Double Hung, Pivoted Upper Sash, Stationary, Pivoted Upper and Lower, Top Hinged, Single Pivoted.

Chicago, Harry C. Knisely Co., 273 S. Canal Street. Double Hung, Pivoted Upper Sash, Pivoted Upper and Lower Sash, Single Pivoted Sash, Stationary, Top Hinged, Pivoted Lower, Top Hinged Upper and Stationary Lower.

Chicago, J. C. McFarland & Co., 27th Street and Fifth Avenue. Double Hung, Pivoted Upper Sash, Pivoted Upper and Lower Sash, Fixed Upper and Pivoted Lower Sash, Single Pivoted, Top Hinged, Stationary Lower and Top Hinged, Upper Sash Stationary.

Chicago, Jas. A. Miller & Bro., 129 S. Clinton Street. Double Hung, Pivoted Upper Sash.

Chicago, Perkinson & Brown, 111 N. Lincoln Street. Pivoted Upper Sash, Pivoted Upper and Lower, Single Top Hinged, Stationary Lower and Top Hinged Upper, Stationary.

Chicago, E. A. Rysdon & Co., 627-629 W. 41st Street. Double Hung, Pivoted Upper Sash.

Chicago, Sykes Steel Roofing Company, 112-120 W. 19th Place. Double Hung, Pivoted Upper, Pivoted Upper and Lower, Fixed Upper and Pivoted Lower, Stationary, Top Hinged, Single Pivoted.

Chicago, Voigtmann & Co., 42-54 E. Erie Street. Pivoted Upper Sash. Pivoted Lower Sash, Pivoted Upper and Lower Sash, Single Pivoted Sash, Three Pivoted, Three Sash, Upper and Lower Stationary, Middle Pivoted, Twin Pivoted, Twin Stationary, Double Hung, Top Hinged Sash, Stationary, Top Hinged Upper and Stationary Lower Sash, Casement.

Detroit, W. J. Burton Co., 164-166 W. Larned Street. Double Hung.

Cincinnati, Jacob Freund Roofing Co., B. & O. S. V. Ry., near Mitchell Avenue. Pivoted Upper Sash, Pivoted Upper and Lower Sash, Single Pivoted Sash.

Cincinnati, Thomas Lee. 128 W. Second Street. Double Hung, Pivoted Upper Sash, Pivoted Upper and Lower Sash, Pivoted Lower, Single Pivoted, Hinged.

Cincinnati, Witt & Brown, 215 W. Third Street. Pivoted Upper Sash, Pivoted Upper and Lower.

Cleveland, Riester & Thesmacher Co., 1514-1526 W. 25th Street. Pivoted Upper Sash, Double Hung.

Columbus, F. O. Schoedinger, 146-148 N. Third Street. Double Hung.

Kansas City, J. A. Ritzler Cornice & Ornament Co. Double Hung, Pivoted.

Kansas City, Henry Weis Cornice Co., 1811-15 Wyandotte Street. Pivoted Upper Sash, Pivoted Upper and Lower Sash, Single Pivoted Sash, Stationary, Double Hung.

Kansas City, Zahner Mfg. Co., 12 West 10th Street. Double Hung, Pivoted Upper, Pivoted Upper and Lower and Single Pivoted.

Milwaukee, Biersach & Niedermeyer Co., 216-220 Fifth Street. Pivoted Upper Sash, Pivoted Lower, Pivoted Upper and Lower, Single Pivoted, Stationary.

Milwaukee, Consolidated Sheet Steel Metal Works, 661 Hubbard Street. Pivoted Upper, Pivoted Upper and Lower Sash, Fixed Upper and Pivoted Lower Sash, Single Pivoted, Stationary, Double Hung, Top Hinged.

New Orleans, American Sheet Metal Works, Carrollton Avenue and Edinburgh Street. Double Hung.

New York, J. F. Blanchard Co., Broadway and 23d Streeet. Double Hung, Pivoted Upper Sash.

New York, The Geo. Hayes Co., 71 Eighth Avenue. Pivoted Upper Sash.

New York, Voigtmann & Co., 427 W. 13th Street. Pivoted Upper Sash, Double Hung.

New York, M. F. Westergren, Inc., 213-221 E. 144th Street. Pivoted Upper Sash, Double Hung.

Philadelphia, David Lupton's Sons Co., Allegheny Avenue and Tulip Street. Pivoted Upper Sash, Pivoted Lower Sash, Pivoted Upper and Lower Sash, Single Pivoted Sash, Double Hung, Casement, Stationary.

Philadelphia, The J. S. Thorn Co., 20th and Allegheny Avenue. Double Hung, Pivoted Upper Sash, Casement, Pivoted Upper and Lower, Fixed Upper and Pivoted Lower, Single Pivoted, Stationary.
Pittsburg, S. Keighley Metal Ceiling & Mfg. Co. Double Hung, Pivoted.
Pittsburg, Rasner & Dinger Co. Double Hung.
Salem, W. H. Mullins Co. Double Hung, Pivoted Upper Sash, Pivoted Lower Sash, Pivoted Upper and Lower Sash, Single Pivoted, Stationary.
San Francisco, Förderer Cornice Works, corner Potrero Avenue and 16th Street. Double Hung, Pivoted Upper Sash.
San Francisco, San Francisco Cornice Co., Bryant between 9th and 10th Streets. Double Hung, Pivoted Upper.
San Francisco, Rulofson Metal Window Works, 315-319 Monadnock Building. Double Hung.
St. Louis, Eagle Metal Works Co., 1510-1512 Clark Avenue. Double Hung.
St. Louis, Hopmann Cornice Co., 2571-2573 Benton Street. Double Hung.
St. Louis, Mesker & Bro., 421-519 S. Sixth Street. Pivoted Upper Sash, Pivoted Upper and Lower Sash, Single Pivoted, Double Hung, Stationary and Casement.
St. Louis, Powers & Boyd Cornice and Roofing Co., 3614-3616 Laclede Avenue. Double Hung.
St. Louis, John F. Ruth Cornice Works, 4298 Page Avenue. Double Hung.
St. Louis, Von Der Au & Cluss Mfg. Co., 2404-2408 South Jefferson Avenue. Double Hung.
St. Paul, St. Paul Roofing and Cornice Co. Double Hung.

WINDOWS, Hardware.

Sash Locks.

Malleable iron locks examined at factory and passed by Underwriters' Laboratories' Inspectors have attached to each box of twelve locks, sealing the box, label reading as follows: *(See Cut No. 17.)*

The following manufacturers are equipped to supply these devices:

Chicago, Payson Manufacturing Co., 1319 Jackson Boulevard.
New Haven, Conn., The H. B. Ives Co., 11-17 Artizan Street.

Sash Locks.

Malleable iron locks examined at factory and passed by Underwriters' Laboratories' Inspectors have attached to each box of three locks, sealing the box, label reading as follows: *(See Cut No. 18.)*

The following manufacturer is equipped to supply these devices:

Philadelphia, Pa., Jas. Peters & Son, 1934-1938 North Front Street.

Sash Chains.

The following sash chain in sizes Nos. 80, 100, 130 and 250, has been examined and tested and is approved for use on metallic window frames and sash with wired glass as follows:

Size No. 80 for sash weighing not more than 90 pounds.
Size No. 100 for sash weighing not more than 120 pounds.
Size No. 130 for sash weighing not more than 160 pounds.
Size No. 250 for sash weighing not more than 210 pounds.

Community Guaranteed Sash Chain. Oneida Community Limited, Oneida, New York.

WIRED GLASS.

It has not been judged necessary to extend label service to this material up to the present time. Distinctive marks applied by the companies themselves to that portion of their product constructed in accordance with the standard (without constant supervision of such marking by the Laboratories) has been considered acceptable.

New York, N. Y. Mississippi Wire Glass Co.

This company claims exclusive right to the use of hexagonal mesh in wired glass. Decision of the Court of last resort on this claim is not yet obtained. In the meantime sub-standard wired glass using hexagonal mesh is occasionally found on the market. Members should therefore make careful inspection of this type of product before acceptance.

Philadelphia, Pa. Continuous Glass Press Co.
Marking: Consists of a strand of the wire mesh made by twisting two No. 27 gage wires together, and spacing such distinctive cabled strand approximately 10 inches apart in each sheet of glass manufactured.

Streator, Ill. Western Glass Co.
Marking: Consists of five loops at each vertical strand of wire mesh.

Pittsburg, Pa. Arbogast-Brock Glass Co.
Marking: A U-shaped piece of wire, 3-16 of an inch in height, embedded near one corner or spaced about 15 inches apart vertically and horizontally in each light.

Washington Pa. Highland Glass Co.
Marking: Consists of a double strand of wire at intervals of 9½ inches. The two wires of the double strand are not twisted together except at the twisted portions of the mesh.

W. H. MERRILL, *Secretary.*

Committee Reports.

EXECUTIVE COMMITTEE.

H. L. Phillips, Chairman,
5 Haynes Street, Hartford, Conn.

The Executive Committee held its second meeting of the year in rooms of the National Board of Fire Underwriters, New York, on Wednesday, November 11th, the following members being present: H. L. Phillips, Chairman, Hartford, Conn.; W. H. Merrill, Chicago; W. G. Sanderson, Chicago; G. E. Bruen (representing Mr. H. K. Miller), New York; Chas. A. Hague, New York; C. M. Goddard, Boston; E. B. Creighton, Philadelphia.

In addition to members of the Committee there were present by invitation of Mr. H. L. Phillips, Chairman, the following:—Mr. H. A. Fiske, Editor of the Quarterly, Mr. W. C. Robinson, Chairman, Committee on Fire Protection Coverings for Window and Door Openings, and Mr. H. W. Forster, Chairman, Committee on Hose.

Committee was appointed to draft suitable resolutions on the death of Alfred Stone, member of the Executive Committee for a number of years.

Chairman Robinson, of Committee on Fire Protection Coverings for Window and Door Openings, submitted report for Rules on Fire Doors and Shutters. These were accepted with few amendments.

Mr. Robinson also submitted an interesting report at some length on tentative specifications for testing brick.

At the request of the Committee on Devices and Materials a Special Committee on Wood Stave Pipe was authorized, with instructions to report to the Device and Material Committee. The Chairman subsequently appointed the following as members of this Committee:—

Mr. Chas. A. Hague, Chairman, Mr. C. B. Roulet and Mr. Albert Blauvelt.

Mr. H. W. Forster, Chairman, Committee on Hose, reported at length on the progress in specifications for Public Department Hose, and Mr. Cole, President, and Mr. Hare, Secretary, of the Mechanical Rubber Goods Manufacturers' Association, appeared before the Committee and supplemented communications attached to the report of the Committee. It was voted to appoint a Special Conference Committee on Hose, empowered to confer with the proper officials of the Manufacturers' Association with a view to going more thoroughly into the points brought out by the Manufacturers. The Chairman appointed the following:—

Mr. W. H. Merrill, Chairman, Mr. C. M. Goddard, Mr. E. B. Creighton, Mr. G. E. Bruen, Mr. H. W. Forster.

Invitation was received to attend the annual meeting of the Society of Naval Architects and Marine Engineers. Mr. G. E. Bruen was appointed delegate.

Other subjects discussed included advertising in the QUARTERLY, Spark Arrestors for Locomotives, and Exhibits at Conventions. On the last named subject the Committee decided it was not in position to undertake the management or inception of such exhibits, or to stand sponsor for them.

W. H. MERRILL, *Secretary.*

COMMITTEE ON DEVICES AND MATERIALS.

W. C. Robinson, Chairman,
382 Ohio Street, Chicago.

This Committee held its regular quarterly meeting in the rooms of the National Board of Fire Underwriters, New York, on Tuesday, November 10, the following members being present:—

Mr. W. C. Robinson, Chairman, Chicago; W. H. Merrill, Secretary, Chicago; W. G. Sanderson, Chicago; Wm. A. Anderson, New York; F. J. McFadden, New York; F. J. T. Stewart, New York; Gorham Dana, Boston; H. O. Lacount, Boston; E. A. Northey, Boston; Ralph Sweetland, Boston; T. Z. Franklin, Philadelphia; R. H. Newbern, Philadelphia; Jas. H. Kenney, (representing Mr. C. A. Hexamer) Philadelphia; H. L. Phillips, Hartford, Conn.; H. A. Fiske, Hartford, Conn.; F. W. Jenness, Syracuse, N. Y.

The session was largely devoted to consideration and action on the usual number of reports submitted by the Laboratories, covering principally automatic sprinklers, sprinkler alarm valves, chemical extinguishers, automatic fire alarm systems and hose racks. Among the subjects discussed was the general one of carbonic acid gas extinguishers, and it was voted to request the Laboratories to furnish standards for all sizes and capacities of these devices judged to be necessary in general use,—these being additional to the stationary type, 3-gallon type and 40-gallon type at present recognized.

On the subject of Wood Stave Pipe the Committee recommended that the Executive Committee appoint a Special Committee on this topic, with instructions to report to the Committee on Devices and Materials.

The details of the actions on the various appliances referred to above have been promulgated through the usual channels.

The list of approved devices printed in this issue includes the names of those on which final favorable action was taken, and the Laboratory cards register the criticisms on others which were endorsed.

COMMITTEE ON FIRE-PROOF CONSTRUCTION.

E. T. Cairns, Chairman,
76 William Street, New York.

The only fire-proof building fire reported to this Committee since the issue of the last QUARTERLY occurred recently in a mattress factory in Minneapolis, involving no serious loss but demonstrating again the advantage of fire-proof or non-inflammable construction over the ordinary wooden type.

The building involved was a moderate sized four-story structure of reinforced concrete construction, the details of which were not given.

The fire occurred in a room occupied by felting machine and ignited a large quantity of cotton in and about the machine. It was extinguished by the fire department with a considerable loss on the stock, but no appreciable damage to the building. The fire was of too short duration to afford any test of the construction, but undoubtedly long enough to have set fire to any sort of wooden construction and resulted in a material loss on any building of that class, particularly in view of the absence of any private extinguishing devices of importance.

While it is true that the word "fire-proof" as applied to buildings is generally a misnomer, and it is the aim of this Committee to establish in due course a high standard for the type of construction which shall approach fire-proof as nearly as possible, it must be admitted that many of the present buildings called fire-proof are of great value in retarding the spread of small fires until the extinguishing devices can be brought into play.

In the case cited above, it is probably not important whether or not the building was of a high standard of fire-proof construction. It was, in any event, sufficiently fire resistive to stand without injury until the fire department extinguished the blaze in the contents, and a structure built well enough for that is decidedly better than ordinary joisted construction.

There have doubtless been many other instances of this sort in the past year or two, if not in the last three months, which have not been reported to the Committee, and I again take the opportunity of soliciting the co-operation of the members of the National Fire Protection Association in reporting fires in buildings claiming fire-proof classification, whether the damage be large or small.

COMMITTEE ON GRAVITY TANKS.

Gorham Dana, Chairman,
93 Water Street, Boston.

This Committee has held no meetings as yet but hopes to start its work in the near future.

Suggestions from any members of the Association in regard to rules covering tanks of any kind are solicited.

COMMITTEE ON HOSE.

H. W. Forster, Chairman,
137 So. Fifth Street, Philadelphia.

Chairman Forster reports that the specifications which have been completed on fire department hose are now being considered by a Conference Committee between the N. F. P. A. and the Hose Manufacturers' Association. It is hoped in the near future specifications will be promulgated covering this most important subject.

COMMITTEE ON HYDRANTS AND VALVES.

L. H. Kunhardt, Chairman,
31 Milk Street, Boston.

The Chairman writes that he is about to take up the question of specifications covering indicator posts but that he has not as yet had time to draw up details. We would suggest that members furnish the Chairman with any information on this class of device which may have come to their attention, particularly as to any defect found through field experience.

COMMITTEE ON PIPE.

Albert Blauvelt, Chairman,
171 La Salle Street, Chicago.

The Committee is engaged in correspondence, with a view to ascertaining the relative merits and harmonizing the differences, if possible, between the American and the New England Water Works Associations standards for cast-iron pipe.

COMMITTEE ON UNIFORM REQUIREMENTS.

Gorham Dana, Chairman,
93 Water Street, Boston.

The changes proposed by the Committee at the last Annual Meeting of the Association were passed with certain modifications.

In the matter of thickness of walls the Committee was instructed to wait until the Conference Committee, composed of N. F. P. A. and National Board of Fire Underwriter representatives, decided on a new schedule. Up to the present time, there has been no meeting of this Conference Committee and the Uniformity Requirements Report is, therefore, held up until such a meeting is held.

The following Committees have no report to make at this time:—Artificial Refrigeration, Automatic Sprinklers, Concrete and Reinforced Concrete for Building Construction, Conference on Building Code, Fire Protection Coverings for Window and Door Openings, Grain Elevators, Manufacturing Risks and Special Hazards, Pneumatic Conveyors of Stock and Refuse, Private Fire Supplies from Public Mains, Pumps, Signaling Systems, Standard Hose Couplings and Hydrant Fittings for Public Fire Service, Theatre Construction and Equipment.

Musical Instrument Factories---Fire Record.

Total Number of Fires, 91.

This record includes Piano Factories, 58 fires; Piano Case Factories, 5 fires; Keyboard Factories, 3 fires; Piano Action Factories, 3 fires; Organ Factories 14 fires; Sounding-Board Factories, 2 fires; Miscellaneous Musical Factories, 6 fires.

1. CLASSIFICATION OF CAUSES.

Common Causes.

LIGHTING. Number of fires, 1.
Gas jet ignited dust which sifted through floor from sandpapering machine above.

HEATING. Number of fires, 1.
Hot air furnace used at the time for burning rubbish.

POWER. Number of fires, 2.
Ignition of gas at meter supplying gas engine.
Hot journal.

BOILER (or fuel). Number of fires, 12.
Sparks or heat from boiler ignited shavings and sawdust in boiler room, 8 fires.
Rubbish piled in front of boiler.
Ignition of dust on boiler breeching.
Heat from boiler ignited coal dust which had sifted in between walls.
Defective flue.

RUBBISH (or sweepings). Number of fires, 3.
Spontaneous combustion of rubbish in metal-lined box.
Spontaneous combustion in box of sweepings.
Spontaneous combustion in a box of shavings and sawdust.

OILY MATERIAL. Number of fires, 4.
Spontaneous combustion of oily waste, 3 fires.
Spontaneous combustion of workman's overalls.

SMOKING. Number of fires, 3.

LIGHTNING. Number of fires, 1.

LOCOMOTIVE SPARKS. Number of fires, 0.

MISCELLANEOUS. Number of fires, 2.
Careless handling of safety match.
Gasoline soldering stove used by tinsmith on roof blazed up and was pushed off roof. It fell in doorway of pattern shop and ignited same.

Special Hazard Causes.

DRY KILNS. Number of fires, 12.
Overheating of steam pipes.
Combustible material on steam pipes.

Heat coils under lumber.
Sparks from defective boiler flue which passed through dry kiln.
Hot bearing on blower in attic of dry kiln.
Fan rubbed against casing causing friction or spark, 2 fires.
Unknown in dry kilns, 5 fires.

SHAVING VAULTS. Number of fires, 6.
Sparks from boiler in shaving vault, 2 fires.
Sparks from boiler in shaving chute.
Spontaneous combustion of fine dust in concealed space in vault.
Unknown in shaving vault, 2 fires.

SHAVING AND SAWDUST CONVEYORS. Number of fires, 2.
Spark ignited sawdust in conveyor pipe.
Cyclone separator stopped up scattering shavings and dust on boiler house roof and window-sill of dry house where sparks from stack set fire to same.

PLANING. Number of fires, 1.
Belt shipper of buzz planer coming in contact with pulley threw sparks into shavings.

SANDPAPERING. Number of fires, 1.
Spontaneous combustion or spark under sandpapering machine.

GLUE POTS. Number of fires, 1.
Explosion of alcohol lamp used to heat glue pot.

OIL AND VARNISH STORAGE. Number of fires, 1.
Unknown in varnish, oil and shellac storage room.

DIP TANK. Number of fires, 1.
Leak in one of the dipping tanks. Fumes ignited from lantern carried by watchman.

RUBBING AND FINISHING RAGS. Number of fires, 15.
Spontaneous combustion of finishing rags, 14 fires.
Finishing rags thrown under rack containing stock of celluloid.

Summary.

Common Causes.

	No. of Fires.	Per Cent. of Whole.
Lighting	1	1.4
Heating	1	1.4
Power	2	2.9
Boiler (or fuel)	12	17.4
Rubbish (or sweepings)	3	4.3
Oily Material	4	5.8
Smoking	3	4.3
Lightning	1	1.4
Locomotive Sparks	0	0
Miscellaneous	2	2.9
Total	29	

Special Hazard Causes.

	No. of Fires.	Per Cent. of Whole.
Dry Kilns	12	17.4
Shaving Vaults	6	8.7
Shaving and Sawdust Conveyors	2	2.9
Planing	1	1.4
Sandpapering	1	1.4
Glue Pots	1	1.4
Oil and Varnish Storage	1	1.4
Dip Tank	1	1.4
Rubbing and Finishing Rags	15	21.7
Total	40	
Common Causes	29	42
Special Hazard Causes	40	58
Total	69	
Incendiary	1	
Exposure	5	
Cause Unknown Fires	16	
Total Musical Instrument Factories Fires...	91	

2. DETAILS OF CAUSES.

Special Hazard Causes.

S-1650. Explosion of an alcohol lamp used for heating glue pot, immediately after being lighted, caused a can of alcohol near by from which the lamp had been filled, to also explode.

H-2068. One of the dipping tanks had a leak and fumes were ignited by watchman's lantern as he was passing through the room. It was a quick flash fire, the woodwork in room being scorched and charred. The tanks are provided with covers, but, as stated, one of the tanks was leaking.

S-5163. Exhaust steam is used for heating steam coil in fan room during daytime but at night live steam is used. It is supposed to be turned on when exhaust steam is shut off; watchman forgot to do this, however, but remembered it later on after pipes had cooled, thus giving a chance for unequal expansion of fan and casing. Shortly after he turned on steam, he saw superintendent and told him about it. The superintendent started at once for fan room arriving just in time to see blaze starting in fan room.

The fan which caused fire is of Sturtevant make, about five years old, with flat blades held by circular ring next each side casing. Fan runs at about 225 revolutions. Two "blisters" or disfigurations on casing can be seen. At one of these the iron of casing is marred badly as if it had been struck a severe blow.

3 ROOMS IN WHICH FIRE OCCURRED.

	Common Causes.		Special Hazards.		Unknown Incendiary Exposure.		Total Fires.	
	No. of Fires.	Per Cent.	No. of Fires.	Per Cent.	No. of Fires.	Per Cent.	No. of Fires.	Per Cent.
Storage and Non-Manufacturing ...	5	19	2	5	4	31	11	14
Boiler Room	13	48	..	..	1	8	14	18
Dry Kiln	1	4	11	28	1	8	13	16
Sawdust Vault	..	..	6	15	1	8	7	9
Blower System	..	..	2	5	..	..	2	3
Mill Room, Sawing and Planing	3	11	2	5	4	31	9	11
Veneering Room ...	1	4	..	..	..	..	1	1
Machine Shop	..	..	..	..	1	8	1	1
Varnish and Finishing Room	2	7	15	37	1	8	18	23
Sounding-Board Room	1	4	..	..	..	..	1	1
Key Finishing Room	..	..	1	3	..	..	1	1
Case Assembling Room	1	4	1	3	..	..	2	3
Total with data given	27		40		13		80	
No data	2		0		9		11	
Total	29		40		22		91	

4. DAY OR NIGHT. (Day Fires 6 a. m. to 6 p. m.)

	Common Causes.		Special Hazards.		Unknown. Incendiary, Exposure		Total Fires.	
	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
Day	11	39	15	40	7	37	33	39
Night	17	61	23	60	12	63	52	61
Total with data given	28		38		19		85	
No data	1		2		3		6	
Total	29		40		22		91	

5. PLANT IN OPERATION.

	Common Causes.		Special Hazards.		Unknown. Incendiary, Exposure		Total Fires.	
	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
Plant in operation	9	37	9	27	6	40	24	33
Plant not in operation	15	63	24	73	9	60	48	67
Total with data given	24		33		15		72	
No data	5		7		7		19	
Total	29		40		22		91	

6. HOW DISCOVERED.

	Common Causes.		Special Hazards.		Unknown. Incendiary, Exposure		Total Fires.	
	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
Employee	8	29	11	28	8	47	27	32
Watchman	12	43	21	54	3	18	36	43
Thermostat	1	4	..	..	..	..	1	1
Sprinkler Alarm.	4	14	2	5	1	6	7	8
Outsider	3	11	5	13	5	29	13	15
Total with data given	28		39		17		84	
No data	1		1		5		7	
Total	29		40		22		91	

SPRINKLER FIRE RECORD.

7. EFFECT OF SPRINKLERS.

	No of Fires.	Per Cent. of Whole.
Extinguished or practically extinguished fire	43	72
Held fire in check	14	23
Unsatisfactory	3	5
Total	60	
No Claim	19	32
Small loss	36	60
Large loss	5	8
Total	60	

8. DETAILS OF UNSATISFACTORY SPRINKLER FIRES.

1820. New York, N. Y. March 20, 1902. Piano Factory. Five-story brick piano factory. Light joist construction. Adjoining this was a three-story brick joisted building, part occupied by same people, and communicating on second and third floors, the door openings being protected by inferior tin-clad fire doors.

Fire started in the three-story unsprinklered building burning out the two upper floors of the sprinklered building. The fire doors, although of inferior type (single lock and poorly hung), prevented fire from entering on the lower floors. The windows on five-story building above three-story exposure were protected by light iron shutters on light flat iron frames. These shutters were said to have been closed but the heat curled the shutters so that fire had no difficulty in passing through the window openings.

The main factory was protected by an old-style Harkness soldered joint equipment. Wet system, supplied by 5,000 gallon tank. This tank was soon emptied and the sprinklers had little effect on holding the fire. It is possible that a standard equipment with good water supplies might have prevented the fire from entering.

Summary: Exposure.

2672. Rochester, N. Y. December 15, 1903. Piano Factory. Four-story brick piano factory of open joist construction. Basement contained six dry kilns and stock of lumber. There was a space under the basement where there was a raceway and the four-inch main power shaft, belts and pulleys were located here. Space under basement was not sprinklered, rest of risk was equipped with Grinnell issue "D" sprinklers, wet system, supplied by waterworks 70 pounds pressure. This fire was the last of three large fires in Rochester all on the same night. The second and largest fire was about 800 feet distant and it is supposed that embers from this fire fell in the open raceway and were drawn under the building setting fire to the oily dust and woodwork around bearings of main shaft. Fire seems to have spread through the basement to large tin-lined elevator shaft in corner and then up through all the floors in the building. The fire department were handicapped by being at another fire and also risk was somewhat inaccessible being located on the bank of a river.

So far as the sprinklers are concerned the fire started in unsprinklered space under building. It is not surprising the fire gained sufficient headway to get beyond control and furthermore the water pressure may have been materially reduced owing to the other fire in progress.

Summary: Unsprinklered portions.

4886. New York, N. Y. May 14, 1906. Piano Case Factory. Fire occurred in boiler room and shaving bin, brick floor and brick arch ceiling. Fire occurred at 6 p. m. and while there was a watchman supposed to be on duty, he did not discover the fire. Fire spread from shaving vault through the blower ducts to the various floors and the entire building was destroyed. Risk was equipped with Gray

No. 2 sprinklers, old standard pipe sizes and spacing, wet system, supplied by 7,500 gallon gravity tank.

Apparently the sprinkler system had no effect on the fire, probably because of defective sprinklers as the equipment appears to have been in service. The sprinklers were of old type and known to be unreliable.

Summary: Defective sprinklers.

9. DETAILS OF LARGE LOSS SPRINKLER FIRES. (Where sprinkler control is satisfactory.)

1908. Ivoryton, Conn. July 15, 1902. Keyboard Factory. Building was struck by lightning and night watchman rendered unconscious. When he came to he found that a sprinkler had opened over his head and building was on fire. He blew the whistle and summoned the local department who used seven or eight hose streams apparently without much regard as to the magnitude or location of fire, thereby causing unnecessary water damage.

Seven sprinklers opened and practically extinguished the fire. Estimated loss, $12,000.

Summary: Excessive water damage from hose streams.

5219. Chicago, Ill. August 21, 1906. Musical Instrument Factory. Fire occurred in finishing room on second floor in rack used for storing about 600 pounds of sheet celluloid.

This was in the finishing department and fire was probably caused by oily waste thrown under rack. Fire occurred at night and sprinkler alarm notified watchman who rang in the fire alarm box.

The heat from burning celluloid opened 27 sprinklers and one pressure tank and two gravity tanks were drained, the fire however being practically extinguished by the sprinklers. Loss estimated at $10,000.

Summary: Celluloid fire opened large number of sprinklers.

10. POINTS OF INTEREST FROM FIRE REPORTS.

Alarm Service.

S-669. Watkins thermostat operated and notified department. Sprinkler alarm failed on account of chain catching and not releasing weight. Watchman smelt smoke on first round, failed to discover fire, continued on round and at completion was notified by department breaking in doors.

S-4142. Thermostat system failed for the following reason. Floors are four-foot bays and there is a row of thermostats in every fourth bay, namely 16 feet apart. Fire occurred about midway between two lines of thermostats, there being two floor timbers between fire and line of thermostats.

Automatic Sprinklers.

S-4892. In attic of kiln adjoining that where fire originated were 34 Manufacturers' 300° heads, of these only eight opened although all were subject to most intense heat. Roof joists within 18 inches of

some of these heads were burned about one-third through. Unreliability of high test heads again demonstrated; also need of complete installation covering all areas.

Concealed Space.

S-899. Fire worked in behind the wire lath and plastering and fire department had to cut a large hole in roof to get at it.

Construction.

S-4276. Building is of poor construction, open joist with lathed and plastered walls. There are no fire stops at each floor, and fire went directly from bottom to top of building. A six-inch space between chimney and outside boarding formed a pathway for the fire.

Gate Valves.

S-5126. Fire was practically extinguished at once by sprinkler, but water flowed about twenty minutes owing to firemen not knowing which valve to shut to stop flow of water.

Obstruction to Distribution.

S-376. The bench under which fire occurred prevented the water from reaching the fire directly.

S-390. Fire occurred on sixth floor in box of sweepings next to boxing around power transmission. The boxing around cables prevented water from reaching all burning parts and allowed draught to blow fire to three floors.

S-1586. Lumber in dry kiln obstructed water from sprinklers so that they could not extinguish fire.

11. NUMBER OF SPRINKLERS OPENED.

No. of Sprinklers Operating.	Extinguished Fire. No. of fires.	Extinguished Fire. Per cent.	Held Fire in Check. No. of fires.	Held Fire in Check. Per cent.	Unsatisfactory. No. of fires.	Total. No. of fires.	Total. Per cent.	No. of Sprinklers Operating.	No. of fires.	Per cent. of whole.
1	27	63	1	7	..	28	47	1	28	47
2	6	14	3	21	..	9	15	2 or less	37	62
3	8	19	1	7	..	9	15	3 or less	46	77
4	..	..	1	7	..	1	2	4 or less	47	78
5	..	..	..	..	..	..	..	5 or less	47	78
6 to 9 inc.	..	..	3	21	..	3	5	Less than 10	50	83
10 to 24 inc.	..	..	3	21	..	3	5	Less than 25	53	88
25 to 49 inc.	2	5	1	7	..	3	5	Less than 50	56	93
50 and over	..	..	1	7	3	4	7	50 and over	4	
Total	43		14		3	60				

Average number of sprinklers opened not including unsatisfactory, 5.2.

12. ALARM SERVICE.

	Satisfactory.		Failure.		Total.
	No. of Fires.	Per Cent.	No. of Fires.	Per Cent.	
Watchman alone	18	100	..	..	18
Sprinkler alarm alone	4	100	..	..	4
Thermostat alone	1	50	1	50	2

	Watchman.		Sprinkler Alarm.		Thermostat.		Total.
	Satis-factory.	Fail-ure.	Satis-factory.	Fail-ure.	Satis-factory.	Fail-ure.	
Watchman and Sprinkler Alarm	2	4*	5	1	..	..	6
Watchman and Thermostats	..	1*	..	..	1	..	1
Sprinkler Alarm and Thermostats	..	..	1	..	..	1	1
Watchman, Sprinkler Alarm and Thermostats, ...	2	1*	2	1	2	1	3

*These include fires where sprinkler alarm or thermostats notified the watchman.

Note.—These tables do not include fires where alarm service does or does not operate properly if fire is at once discovered by employee, the alarm service having no bearing on such fires one way or the other.

13. SECONDARY WATER SUPPLIES.

964. Primary supply two small pressure tanks. Second supply, steam pump. Fire was in dry room and 34 heads opened. Second supply of much value in holding fire in check.

4892. Primary supply pressure tanks 90 pounds pressure. Second supply steam pump. Seventeen sprinklers opened and held the fire in check. Steam pump was of value in backing up pressure tanks and was run for one and a half hours.

5219. Primary supply pressure tank. Second supply two gravity tanks. Celluloid fire opened 27 sprinklers and all tanks were exhausted but fire was practically extinguished. Second supply undoubtedly of much value.

General Fire Record.

UNSATISFACTORY OR SERIOUS FIRES IN RISKS EQUIPPED WITH SPRINKLERS.

7901. Fall River, Mass. October 8, 1908. Cotton Waste Mill. Fire occurred in two-story picker house, light plank and timber construction. Started at 11.30 p. m.

This building was equipped with Grinnell glass disc sprinklers, 35 on a floor, wet system, modern spacing and arrangement. Sixty-five sprinklers opened. The primary water supply was from waterworks, 50 pounds pressure, also steam and rotary pumps, which however were not used.

All of the second story was destroyed but the first story stands. Probably the sprinklers saved this room and would have saved the upper story if the pressure was maintained. The large number of streams must have pulled pressure down materially. A great mistake was made in not starting the pumps. Assured do not give a clear statement regarding this. They claim that repairs were being made on steam boilers and steam pump was thought to be out of commission, but master mechanic showed afterward how by manipulating valves, one boiler could have been used for pump. The rotary pump was not started. It is likely that there was no one at the fire who thought of the pumps, or if they did, were unacquainted with their management. The mechanic and owners were away. The watchman should have instructions to start pump at once in case of fire.

Summary: Hose streams reduced pressure from waterworks and pumps were not used.

8072. Rock Island, Ill. October 10, 1908. Sash, Door and Blind Factory. Approximately 2,000,000 feet of lumber and other unsprinklered building adjoining caused such a fierce fire that it was impossible for sprinklers in factory to hold it in check. The equipment was antiquated and of questionable value.

Summary: Exposure fire.

8074. Blaine, Wash. October 12, 1908. Saw Mill. Two-story frame saw mill, open joist construction, sides partly open, located on piling on tide lands. Fire occurred at night and undoubtedly started outside of saw mill and probably under wharf adjoining mill and quickly spread under mill itself.

Risk was equipped with sprinklers on dry system, but they were of little or no effect and risk was entirely destroyed. Outside protection poor.

Summary: Unsprinklered portions.

8032. Sherbrooke, Canada. October 12, 1908. Woolen Mill. Fire occurred in wheel house, frame joisted construction, and was

caused by hot bearing. There were four sprinklers in the room which opened, but they were of no effect as the sprinkler piping was clogged with small pieces of wood. Fire was finally controlled by hose streams.

Summary: Sprinkler pipes clogged.

7974. Hawthorne, N. J. October 16, 1908. Silk Dyeing. Fire started in frame building containing dryer and dyeing machine, probably starting in dryer. Plant was in operation, and there were three employees in the building at the time. This building was equipped with sprinklers which, however, did not hold the fire in check as the dryer and roof were burned. Fire was finally controlled by hose streams. It is not known whether system was in service or not.

Summary: Not classified.

8081. Boston, Mass. October 20, 1908. Cotton Waste Factory. Fire started in a bale of cotton which was being opened up for sorting and extended to the second and third floors on account of cracks in the floors. Owing to these floor openings and the rapid spread of the fire, the work of the sprinklers was more or less unsatisfactory and 33 heads in all opened. The sprinklers were old style with small pipe sizes and poor spacing.

Summary: Generally defective equipment.

8075. Ballston, N. Y. November 12, 1908. Tannery. Risk consisted of a large group of frame buildings adjoining and communicating. Fire occurred in the bark mill and leach house section which were frame of poor construction with several frame additions used for storage purposes.

The bark mill and part of the leach house were equipped with Grinnell glass disc sprinklers, dry system, supplied by waterworks 90 pounds pressure and steam pump. The equipment was modern and generally up-to-date although not fully complete.

It is not known just where fire started, whether in the portion equipped with sprinklers or in the unsprinklered portions, and while the latter were of non-hazardous nature, the fire may have started from electrical wiring, or other common causes. The sprinkler system was apparently in full service. The fire had gained considerable headway when discovered and the bark mill and leach house sections were destroyed, the mill buildings being saved by the excellent outside protection.

The most plausible reason for the failure of the sprinklers to hold fire in check seems to be that fire either started in an unsprinklered portion or in the leach house, where floor openings and obstructions may have allowed fire to spread.

Summary: Not classified.

8076. Providence, R. I. November 17, 1908. Woolen Mill. Fire occurred in two-story brick addition used for the storage of wool on the first floor and bobbins on the second floor. The sprinklers in this addition were shut off for the winter, and the fire spread from this building to a wooden stair tower (sprinklers also shut off for winter), forming angle between two other buildings, also spread through unprotected window openings into the main buildings. Seventy sprinklers opened

exclusive of the sprinklers in building where fire started and held fire in check on the various floors aided by the city fire department. Loss estimated at $16,000.

Summary: Water shut off.

8078. Bainbridge, Ga. November 24, 1908. Wholesale Grocery. One-story frame building, plank and timber construction, equipped with Grinnell sprinklers, dry system, Grinnell Straightway dry valve, supplied by town waterworks, 35 pounds pressure. Fire occurred at 6.15 p. m. from unknown cause. Sprinkler system appears to have been of no value and indications tend to show that the post indicator gate controlling this system was nearly shut, so that air valve only partly opened. The fire was discovered by an outsider and as the town protection was poor the fire was soon beyond control.

On examination of the sprinkler equipment and dry valve after the fire it was found that the air valve started to operate all right and then stopped. The air valve was removed and a careful examination made which seemed to show that valve would have worked all right had there been sufficient water behind it.

Summary: Water shut off.

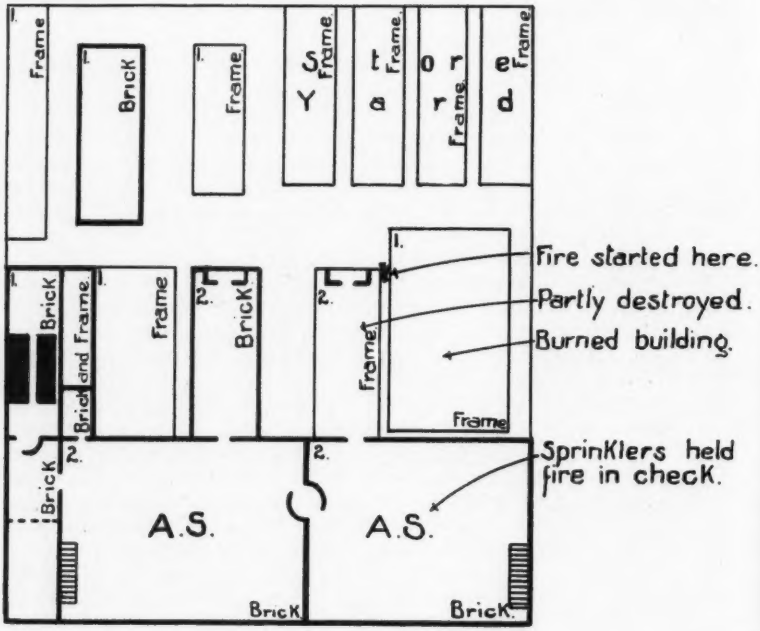
8087. Greenville, R. I. December 9, 1908. Cotton Mill (Absorbent). Fire occurred on first floor of mill constructed building used for opening, drying and carding of cotton. Fire started at 6.45 o'clock in the evening after mill had shut down and there was no watchman. It was discovered by an outsider. Building was equipped with Esty sprinklers, 88 on first floor. Sprinklers ten to eleven feet apart in eight-foot bays. Wet system. Primary supply from 5,000 gallon gravity tank giving approximately 29 pounds pressure on the first floor sprinklers. Second supply was a rotary pump. There was a large amount of cotton in the room and fire spread rapidly. The rotary pump was used for hose streams so that it was of little service to the sprinkler system and tank was probably quickly drained. Building was destroyed. There is supposed to have been about twelve bales of open cotton in the room.

Summary: Defective water supplies.

8007. Chicago, Ill. December 11, 1908. Cooperage. Fire occurred in one-story frame detached building used as a header storage shed. This building was not sprinklered. It spread from here to the two-story sprinklered addition three feet distant, which was also destroyed. Fire was prevented from entering the main brick building by sprinklers and hose streams. The only supply to sprinklers was a 2,000 gallon pressure tank and 8,700 gallon gravity tank and these supplies were soon exhausted.

Summary: Exposure fire.

8079. Montreal, Quebec. December 15, 1908. Jewelry Factory. Four-story, brick building, joisted floors, sheathed, with concealed spaces in floors and partitions. Fire started in concealed spaces between lath and plaster partitions on second floor where there are a number of small rooms. It was discovered at about 3.20 p. m. and public alarm given at 3.24, sprinkler alarm operating about a minute afterwards. Building was equipped with Esty sprinklers, part old and part new



Sprinkler Fire No. 8007.

equipment. Wet system. Primary water supply, waterworks, giving 20 to 30 pounds pressure on sprinklers that operated. Second supply was a 15,000 gallon tank, 16 feet above top line. Fire spread through the concealed space to elevator well and thence to the upper floors, a portion of the three upper stories being burned.

It appears that about ten to fifteen minutes after the fire was discovered the sprinkler system was shut off by an employee, this before fire had spread to any great extent, and presumable reason for shutting off the sprinklers was to save water damage. Water was probably not turned on again until about an hour after fire started. By this time the fire had opened up a large number of sprinklers and the pressure from the waterworks was greatly diminished through the use of numerous hose streams, also the gravity tank was soon exhausted. In other words the sprinkler system was out of service at just the time when it was most needed. The total loss is estimated at $60,000.

Summary: Water shut off before fire was out.

8089. Lynn, N. C. December 21, 1908. Dyeing and Finishing. Old frame building occupied for dyeing and finishing hosiery. Fire

started on outside of building, supposedly sparks from boiler lodging in rubbish on the river side of plant. This part of the building was inaccessible to hose streams and fire was beyond control by the time it reached the sprinklers. Risk was equipped with Grinnell glass disc heads, modern equipment supplied by 25,000 gallon gravity tank which also supplied the hydrants. Risk was practically a total loss.

Summary: Exposure fire.

LARGE LOSS SPRINKLER FIRES.

Where Sprinkler Control is Satisfactory.

8012. Denver, Colo. August 30, 1908. Mercantile, (Clothing, Shoes, Etc.). Fire started in waste vault in basement at bottom of metal-lined chute which opened into each floor with a swinging door. There was one sprinkler in the vault and a sprinkler in the chute below each floor opening. The sprinkler in the vault did not open and apparently it was a defective head, as it seems to have opened partly and then resealed. Two sprinklers in the chute opened but could not entirely extinguish the fire in the vault, with the result that there were great quantities of smoke and the fire was not put out until hose streams were used.

The loss was practically all smoke damage to clothing stock and was settled for about $23,000.

Summary: Defective sprinkler.

8080. Winnipeg, Manitoba. September 27, 1908. Wholesale Mercantile. Fire was on fifth floor occupied by wholesale liquor merchants. Started in straw packing and was extinguished by two sprinklers. Fire occurred Sunday morning between seven and eight o'clock. The night watchman left at seven and the day watchman did not arrive until eight.

This fire seems to have started about the time that the night watchman left the risk and was not discovered until the day man entered the building. The alarm valve is connected to an inside bell which is reported to have operated, but as there was no outside gong and the watchman had left the building, the alarm was of no value. Loss $10,000.

Summary: Defective alarm service.

6912. Portsmouth, Va. October 13, 1908. Full Process Knitting Mill. Fire occurred in card room, second floor and opened up 24 sprinklers, which extinguished the fire. There was a heavy water damage to cards and stock. Loss estimated about $6,500.

Summary: Not classified.

OTHER SPRINKLER FIRES OF ESPECIAL INTEREST.

7941. Leominster, Mass. September, 1908. Celluloid Comb Factory. Employee working at burrer was running piece of stock through under coarse burr on revolving disc with cutting edges when stock flashed into flame without warning. What little dust lay on steel

table around burr took fire instantly and also lot of stock and combs on shelf at hand. About three-bushel open can one-half full of dust (machine was not connected to blower) would have forced employees from room if not saved from fire by quick removal by man nearby. Pails of water were dashed over blazing stock on shelf and fire put out so quickly that only top layer of pieces was somewhat burned. Meantime sprinkler about a foot and a half from directly overhead had gone off and thermostat had sent in alarm to fire department, which arrived shortly after. Desirability of knowing how to handle celluloid fire and quick work in extinguishing it is demonstrated.

7985. La Crosse, Wis. September 1, 1908. Tannery. Spark from a locomotive lodged under metal covering on old shingle roof. High wind was blowing. Roof joists being sheathed made concealed spaces which sprinklers could not reach.

Seventy sprinklers in all opened which held fire in check and it was finally extinguished by hose streams.

7945. Pittsfield, Mass. September 5, 1908. Woolen Mill. Fire occurred about 11 o'clock in rotary dryer on second floor of boiler house and was probably caused by friction and the fact that dryer had not been cleaned out for some little time. Five heads inside the dryer opened and controlled the fire, confining it to that machine, and no sprinklers were opened in the room itself.

6879. Lawrence, Mass. September 30, 1908. Print Works. At 9.15 a. m. a fire occurred in the aniline department on the third floor. A workman was opening a keg of sodium chlorate when it suddenly burst into flame, and he was so severely burned that he afterward died. The overseer heard two explosions, and it is thought probable that the keg which was being opened set fire to another standing a few feet away. Nine sprinklers opened. The mill firemen immediately used three hose streams and the city department was also summoned and laid one line of hose, which was not used as the fire was under control when the department arrived.

7991. Philadelphia, Pa. October 8, 1908. Woodworker. Old Kane sprinklers more or less corroded by vapors and loaded with dirt, were evidently slow in opening. One Kane and one Hibbard found with solder fused, but with levers and links still in position after fire.

7975. Indian Orchard, Mass. October 19, 1908. Celluloid Manufacturing. Fire occurred in the breaker machine setting fire to pyroxylin stock fresh from dryer which was passing through the machine. The fire was in the nature of a mild explosion spreading very rapidly but it was held in check by 33 sprinklers. This process follows mixing with camphor and drying in sheets.

8082. Jamestown, N. Y. November 27, 1908. Furniture Factory. A very good example of the value of open sprinklers against the most severe type of exposure, latter a five-story frame furniture factory, unsprinklered and full of very inflammable material, practically adjoining the old boiler house and not over 22 feet distant from main building, of ordinary iron-clad frame construction. Fire in exposure attained rapid headway and by the time the department arrived they could do nothing but try to protect surrounding property. It was pos-

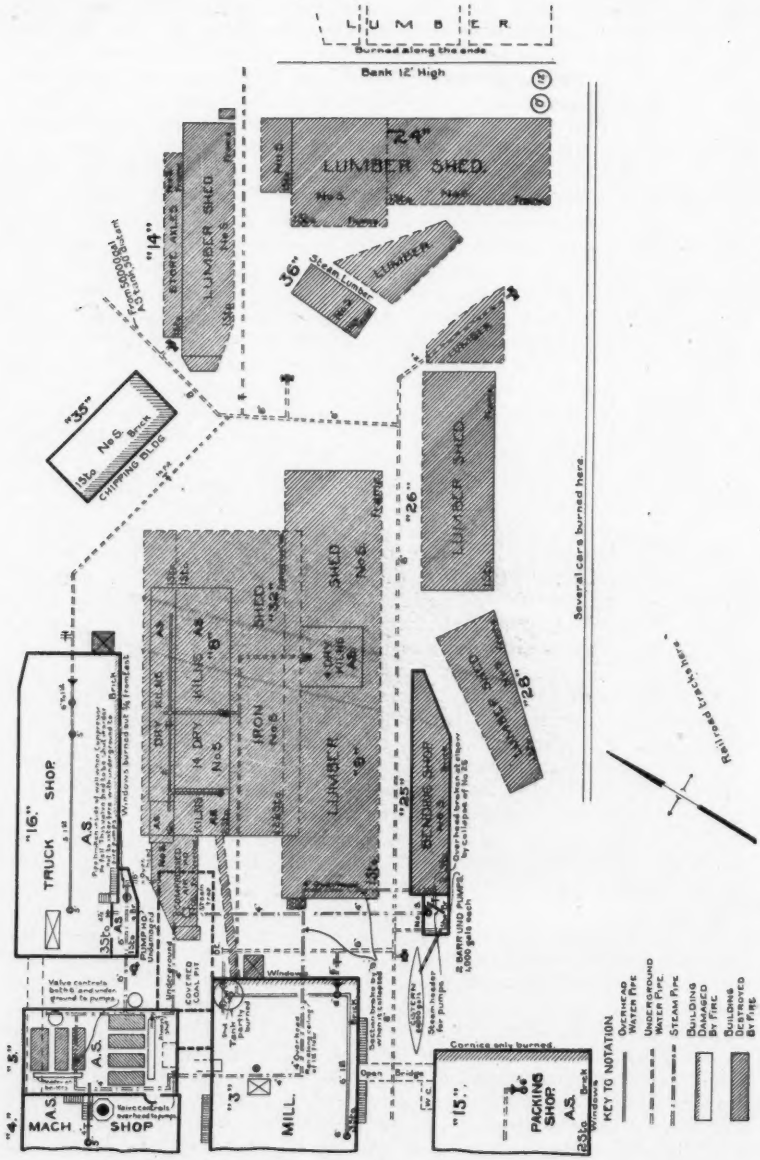
sible for them to stand under the wall of risk and play streams on the unsprinklered risk under the protection of the water curtain from the open sprinklers. Damage was mainly through water loss on the finished stock on the top floor, fire burned off the frame tank tower and worked down through the top of elevator shaft, the frame ventilators on roof were also ignited and burned through, thus opening 11 sprinklers on the top floor. Had the tank tower been protected by open sprinklers also and the roof been without the small ventilators, it is probable that the fire would not have entered buildings at all. The city department appears to have done good work but would have been unable to get anywhere near the building had it not been for the open heads which deserve the credit for saving this risk.

8083. Philadelphia, Pa. November 29, 1908. Car Works. Fire started about 1.30 a. m. in the vicinity of a small storage room located in the east end of lumber shed No. 9, not equipped with sprinklers. Cause unknown. It spread from here to buildings Nos. 8 and 32 which were practically one with No. 9 and none of these portions were equipped with sprinklers except inside of the dry kilns in No. 8, and sprinklers here were undoubtedly of no service, fire having gained such headway. Fire also spread and destroyed numerous other unsprinklered buildings (see plan), notwithstanding the excellent private and public outside protection.

The steam pumps which formed the chief supply for private hose streams and also sprinklers were located in a brick pump house adjoining No. 25 and early in the fire the engineer was obliged to leave the pump house on account of the intense heat. Furthermore, one of the steam connections to pumps ran overhead through No. 9 and was broken early in the fire and it was with great difficulty that an employee finally closed the gate valve on this steam supply in the pump house. A few minutes after pumps were again running a six-inch steam line which ran overhead from No. 16 to No. 8 was broken and this took away the steam from the four-inch underground supply to fire pumps. It was now necessary to close a valve in the boiler house controlling the remaining steam supply to pumps and some twenty minutes elapsed before the steam could be again gotten under control.

In addition to the two 1,000 gallon pumps there was a 50,000 gallon gravity tank which supplied hydrants and sprinklers, but the drain on this tank was severe from hose streams owing to the pumps being temporarily out of service and it was soon emptied. Buildings Nos. 3 and 16 were heavily exposed and windows burned out, but owing to the excellent hose service these buildings were saved. It is stated that the sprinklers in Nos. 3 and 16 played but a small part in saving the buildings and quite early in the fire the water was shut off these sprinklers also the valve controlling underground pipe to sprinklers in No. 8 was closed to save waste. The pressure on the yard hose seems to have been weak owing to temporary disabling of the pumps and the large number of hose streams used, so that the pressure on sprinklers in 3 and 16 was insufficient at least part of the time.

Nine fire engines were used and the public department seems to have given excellent service, especially in saving a large lumber yard at the east as well as keeping the fire out of the sprinklered buildings.



Sprinkler Fire No. 8083.

The following points are noted in the report:—

First—The desirability of locating fire pumps where they will not be endangered by fire. In this risk the fire pumps were originally well located. The plant however had extended and grown around the pump house. To move the pump house would have involved considerable expense due to laying of new suction line and possibly relocation of suction supply.

Second—The necessity of so arranging steam pipes to fire pump that their integrity will be assured. It would probably have been better in this mill to have done away with the overhead steam pipe, although there was a combination of circumstances which might not naturally be foreseen. There are some arguments in favor of having an additional steam pipe overhead. However, there appears to be no satisfactory reason why the six-inch service steam line should be taken from the steam main in the boiler house, on which main the underground line to the fire pump depended, without putting this service line under convenient control in the boiler house itself.

Third—The importance of locating boilers where they will not be endangered by other buildings. With a change of wind the boiler house itself would have been greatly endangered. It was not properly protected to meet such conditions which might have resulted in boilers being abandoned with the consequent breaking down of all private protection and heavy loss.

8088. Leominster, Mass. December 2, 1908. Celluloid Comb Factory. Fire started at shaping machine. A white "viscoloid" comb was being shaped on a six-inch burr wheel when the blank ignited. There was a blower system which ran to blower through the floor below and thence to the dust box outside, which latter was burned. The blower pipe was of metal but did not become hot enough to set fire to woodwork. "Viscoloid" scrap and dust around machine ignited so that fire spread rapidly and opened up 58 sprinklers which practically extinguished the fire.

MISCELLANEOUS FIRE RECORD.

H-3361. Salisbury, Mass. September 24, 1908. Electric Sub-Station (Rotary Transformer). Building of brick, cement and steel, roof cement on steel, steel work unprotected.

This fire was started by lightning which entered the building during the course of a very severe electrical storm. The discharge was not properly taken care of by the lightning arresters and the current jumped to the brick wall of the building, setting fire to the insulation on the high tension wires and the wooden frame work which supported the lightning arresters. The station attendant immediately telephoned the police who notified the chief electrician of the Railway Company and this man went directly to the station. Meanwhile the station attendant and his assistant attempted to extinguish the fire with pails of sand and one of these men was killed as the result of a shock he received when he tried to take down a pail of sand which was hanging on the brick wall about four or five feet from the high tension

wires. The fire continued to burn until the electrician arrived and ordered the current shut off at the power station, after which it was put out with sand. The building was not damaged, but one set of lightning arresters and the wooden frame work which supported them, including porcelain insulators on the wire was seriously damaged. The total damage will probably not exceed $75.

The cause of the failure of the lightning arresters is difficult to determine. It is practically certain that the building itself was not struck but that the discharge was carried to the station by the high tension (13,200 volt) lines. The lightning arrester equipment was of wooden style and approved make. The ground connection consisted of a No. 4 B. & S. wire carried through the floor and out through the wall of the building, thence to a ground which consists of old trolley wire twisted up and buried about five feet below the surface. The soil here is probably always moist, the location being in a marsh which is at times under tide water, but the presence of buildings all around the station might seriously interfere with a good ground connection. It is quite possible that in this case the ground connection was not perfect enough to carry off the discharge. The appearance of the lightning arresters indicates that they worked properly.

It is stated that thunder-storms in this vicinity are very severe, and that in nearly every storm, some trouble is experienced by lightning entering the building. In view of this fact, it would seem advisable to take extra precaution as to proper ground connections and the following recommendations are made:—

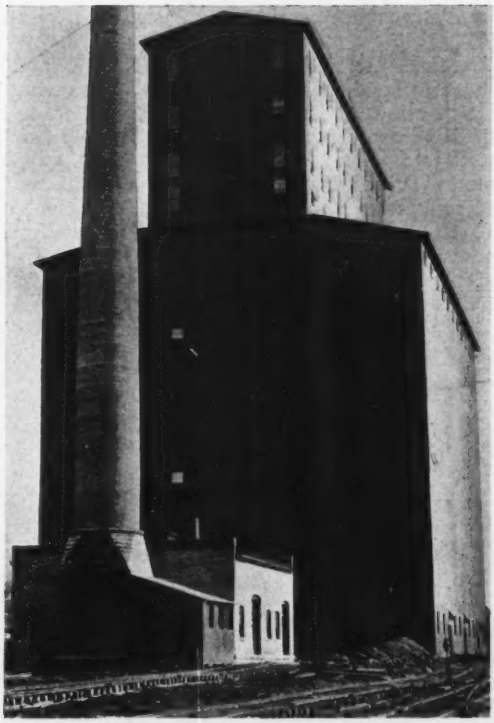
First—In addition to the present ground, provide a copper plate at least two feet square by one-sixteenth of an inch thick to be buried in fine crushed charcoal at least six feet below the surface of the ground, in soft soil.

Second—Connections between lightning arresters and this plate should be made with a continuous copper strip, one inch by one-sixteenth of an inch, run as nearly straight as possible, bushed with porcelain tubes through walls and floors, and soldered and riveted to the plate. Connection should also be made between this plate and the rails.

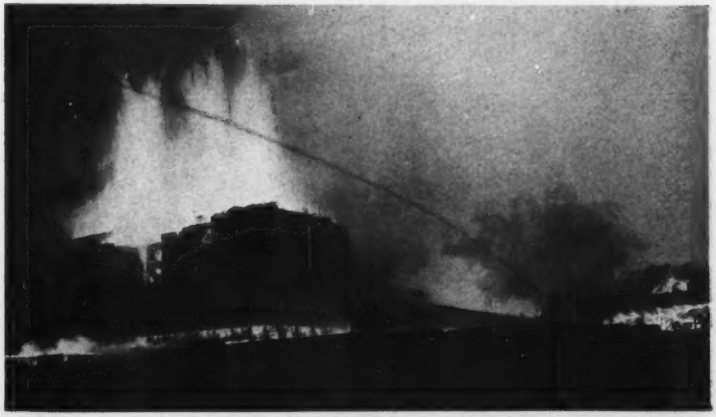
Third—Fire pails should not be hung on the wall near lightning arrester equipment on high tension wiring.

H-3347. Richford, Vermont. October 7, 1908. Grain Elevator. This was a large frame elevator containing 76 storage bins, and also used for mixing and sacking feed, with brick boiler house adjoining. Building lighted by electricity. There was a violent dust explosion the cause of which is unknown.

The explosion, in which the fire had its origin, was of such a nature that the entire elevator from top to bottom was instantly set on fire, and the flames were blown out through all openings. The roof was carried about 125 feet west, several freight cars were blown over and pieces of corrugated roofing were blown at least a quarter of a mile. There were a large number of cars in the yard, and 51 of these were burned, and the adjacent storehouse quickly ignited.



Miscellaneous Fire No. H-3347.



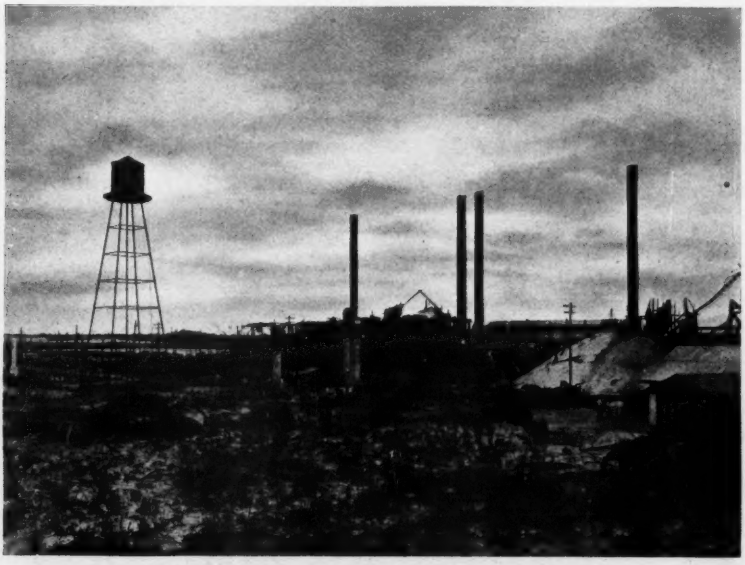
Miscellaneous Fire No. H-3347.
Nineteen Minutes After Explosion.

Elevator and storehouse were totally destroyed also dwellings 150 feet distant.

S-7965. Terra Haute, Ind. October 7, 1908. Cereal Mill. Fire originated in several small open vessels containing carbon bisulphide put at different places on the first floor of the warehouse for fumigation purposes. No reason can be assigned for the fire, but the exceeding volatile and inflammable nature of the liquid would render it especially liable to ignition from sparks or open lights.

H-3266. Springfield, Vermont. October 16, 1908. Electric Car House. This was a frame, joist constructed building and fire started in a box car just inside of the front or open end of the building. By the time the firemen arrived the fire was of such extent that they could not get within 50 feet of the front of the building nor could any cars be gotten out. Building and cars were destroyed. The cause of the fire was unknown except that it started in a car.

H-3387. New York, N. Y. October 27, 1908. Electric Car House. One and two-story brick car house of inferior construction. Fire started in a closed car and was first noticed breaking through the roof of the car. Fire spread rapidly and building was a mass of flames by the time fire department arrived. Fire was probably caused by electrical defects in the car wiring, the trolley pole had been left on the wire and the current was on the barn.



Miscellaneous Fire No. H-3434.

H-3434. Prairie, Fla. November 1, 1908. Pebble Phosphate Works. Fire occurred in dry bin building and was probably caused by

Miscellaneous Fire H-3394.
Showing the wired glass windows in adjoining wall which overlooked the roof of the mercantile building.

Miscellaneous Fire No. H-3394.
Interior view of mercantile building which was entirely destroyed.

hot rock in contact with woodwork. This building was metal lined. It is also possible that a burning ember from the wood fuel used in the dryers may have been carried into dry bin building. There was good private hose protection, but the fire gained too great headway to be controlled and the drying and bin buildings were destroyed.

H-3394. Cleveland, Ohio. November 15, 1908. Mercantile Building. Fire occurred in five-story, brick building of about 7,200 square feet area, ordinary joist construction, elevators enclosed with unprotected openings, also two open stairways. Building occupied chiefly with a stock of ladies' and children's garments. Fire occurred on Sunday morning and spread through building before the arrival of the department.

The poor construction and combustible occupancy, aided by the escape of gas during the process of the fire, made it a particularly stubborn one and it was several hours before it was under control. The flames reached a high point on the walls of the adjoining fire-proof building which towers some seven stories above the one destroyed. The windows in exposing wall of the fire-proof building were protected by wired glass windows with metal frames and sash. These windows were given a severe test and proved entirely effective, although the construction and size were not in accordance with the standard. The glass was badly cracked in many instances but held intact.

The window shades and wooden interior window trimmings back of the wired glass windows were charred and the varnish on the stair-rails 39 inches from the windows was blistered with the heat, showing that combustible material should not be located near such windows.

H-3390. Portland, Me. December 4, 1908. Dock Sheds. Fire started in No. 1 shed from some unknown cause at 12.50 a. m. It was well under way when discovered and rapidly spread through the connecting dock sheds Nos. 1, 2 and 3, all of which were practically a total loss. Near these docks there was a system of enclosed grain conveyor belts which lead to grain elevators. These conveyors were torn down during the fire. Owing to the excellent private and public outside protection the fire was prevented from spreading to Pier No. 2 or the elevators.

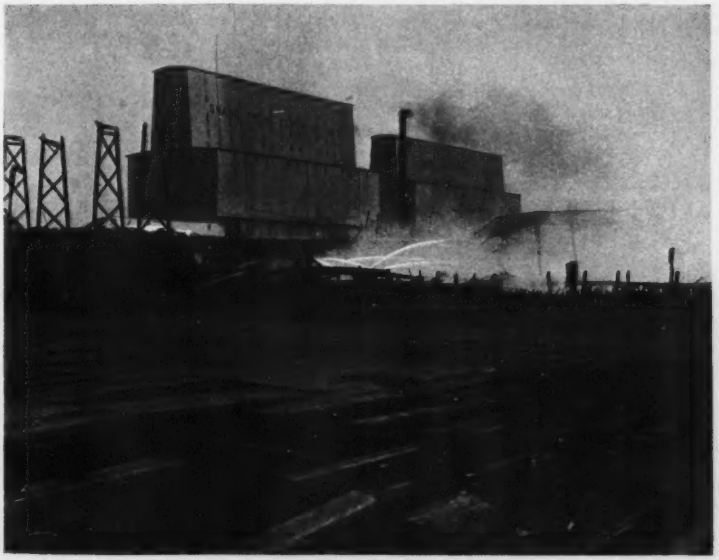
The steamship Cornishman, which lay alongside of Pier No. 2, was quite badly damaged owing to cargo inside being ignited. The dock was protected by interior monitor nozzles and manual alarm boxes, there was also fair watchman service and watchman had passed through shed No. 1 about 40 minutes before fire was discovered. Shed No. 1 was said to be practically vacant, while Nos. 2 and 3 contained a large amount of miscellaneous freight.

Report has the following conclusions:—

First—The value of good fire pump service. The very long lines of hose necessitated high pressures which only this form of protection could give.

Second—The desirability of standard alarm service. The bi-hourly schedule under which these watchmen work, the requirement that they also perform other duties and the lack of automatic alarm

Miscellaneous Fire No. H-3390.
Shows conveyor galleries leading to dock sheds. These galleries were pulled down to prevent spread of fire to elevators.



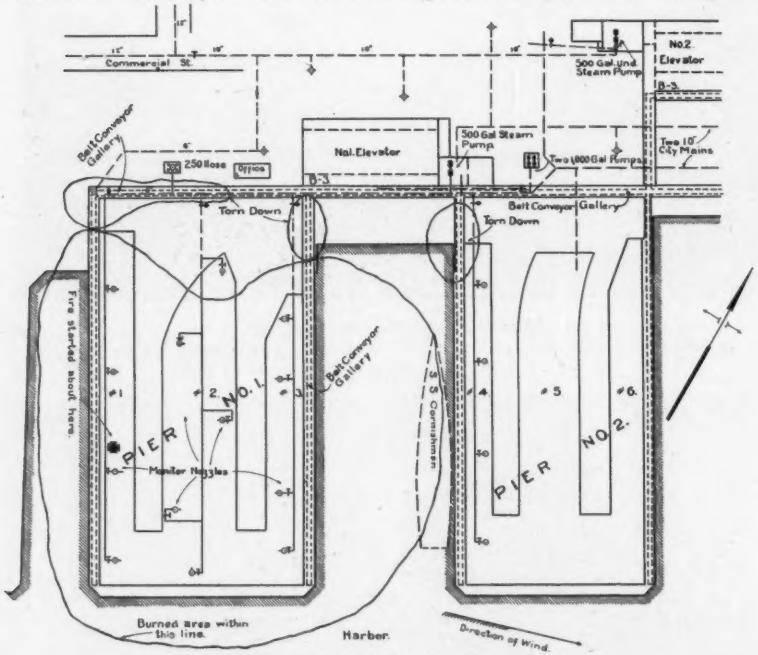
Miscellaneous Fire No. H-3390.
Destroyed dock shed in the foreground. Grain elevator not seriously menaced.

service enabled the fire to get a considerable start before being discovered.

Third—The typical wooden dock structures of large areas on wooden piles not readily accessible and without automatic fire protection are subject to large fire losses.

Fourth—The value of efficient private means for fire fighting and trained men well acquainted with local conditions and use of apparatus.

H-3411. Newark, N. J. December 14, 1908. Patent Leather Factory. The room in which fire started is about 40x40 feet with blank brick walls on three sides and one door (protected by two-inch tin-clad fire door), and four windows (protected by ¼-inch wire glass



Miscellaneous Fire No. H-3390.

in angle iron frames), on the front. Floors are of segmental tile arch (side construction) with cinder fill and brick flooring; flanges of girders being protected by two-inch terra cotta and beam flanges by one-inch terra cotta. First and third floors are of similar construction. Four steam heated drying ovens in each room with brick walls between and sheet metal drop doors, each holding 46 frames in horizontal position. "Daub" is applied in room in front of ovens, near front wall openings, and consists of boiled linseed oil, lampblack, benzine, etc., there being six iron tanks on second floor, each holding about 90 gallons and having flanged metal covers. The dried "daub" is removed

from floor when it becomes about two inches thick, and while tanks are full and ovens are in use. It was while workman was chopping and shoveling this dried "daub" from floor that spark was struck which ignited the benzine vapor. As soon as the fire started the workman ran out and pulled public fire alarm box and no effort was made to fight the fire until the public department arrived. All the "daub" rooms on the first and second floors are provided with two-inch steam jets, with valves on outside of building, and had assured thought to use same, the fire could probably have been extinguished without much loss. The only combustible material in room was the "daub", stretching frames and leather, but this was sufficient to cause a fire which practically consumed the fire door and melted part of the wired glass windows. After the department arrived the flames lapped out through door and window openings and ignited the contents of the room above, in spite of fact that door and windows at third floor were closed. As shown by department records, fire was not extinguished for about two hours and fifteen minutes after alarm was turned in.

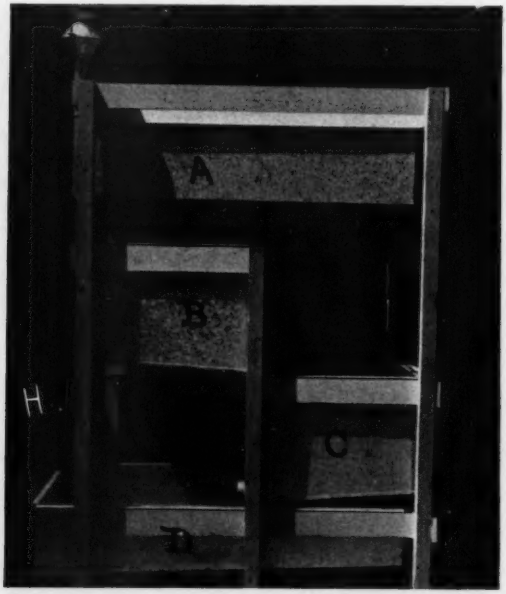
The building damage consists of two fire doors, one being practically consumed (not lock jointed but single seamed), eight wired glass windows, and about 12 feet of girder and 25 feet of beam flange protection which fell off. Stock damage consists of that on second and third floors and a small water damage on stock on first floor.

The hazard of the "daub" rooms could probably be lessened by reducing the quantity of "daub" on hand, either by the use of pumps or by bringing it in smaller quantities; also by requiring removal of all "daub" from room before cleaning. The use of bronze or copper tools might lessen the spark hazard, although use of same probably is not feasible. Signs painted over steam jet valves or attached to same might be of value in reminding assured of their presence.

Notes and Tables.

RE-LYT, A NEW WATERPROOFING COMPOUND.

Among the important hazards of the shoe factory is that of waterproofing the leather. In the past ten years, during which time the process has been developed, several compounds for this purpose have been introduced, chief among which are Viscol, Resisto and Repello, each of which has been the subject of a report published in the Quarterly Bulletin. Viscol is the compound most widely used and best known. It is the most hazardous of the three, because, unlike the others, it requires naphtha for thinning purposes, as otherwise it is too thick to penetrate the pores of the leather. Because of the well known hazardous nature of naphtha it has been necessary to carry on the



Arrangement of Tanks for Applying Re-lyt.

waterproofing process in detached sheds, thus removing the danger of its use from the main factory. This has caused considerable inconvenience and expense to the manufacturer. Resisto and Repello are very similar in nature and differ from Viscol mainly in that there is nothing volatile or inflammable in their composition, therefore they can be used inside the factory. However, judging by the fact that but few manufacturers use them, they do not seem to compare well commercially with Viscol.

A new compound called Re-lyt, manufactured by the Re-lyt Company of Georgetown, Mass., was introduced to the trade in the spring of this year and in six months' time it has largely replaced the others. All that can be learned at present of the ingredients which enter into its composition is that they are oils and greases adapted to softening, preserving and rendering the leather water-repelling. Re-lyt is a liquid which in appearance resembles molasses and, at a temperature of about 50° F., is of a similar viscosity; at a temperature of 80° F., in which condition it is ready to be used, it is about as thick as engine oil. It is necessary to raise Viscol, Resisto and Repello to a temperature of 150° F. or higher in order to obtain proper results, but Re-lyt is used at ordinary temperatures and need never be heated except on cold mornings when it is only necessary to remove the chill.

A small quantity of Re-lyt was placed in an ordinary New York State closed Oil Tester and gradually heated; at a temperature of 362° F. it flashed and at 392° F. it burned. Burning tapers inserted in the oil failed to ignite it. Sticks soaked in the oil burned with slightly increased vigor until the oil was exhausted, but leather soaked in it burned less easily than before. The results of these tests prove that Re-lyt is a comparatively non-inflammable and non-hazardous compound at ordinary temperatures and in class with spindle and engine oil.

The method of using Re-lyt as introduced by the manufacturers is new and one that recommends it. A cut of the equipment is here shown. It consists of four tanks made of No. 24 galvanized iron turned over on the top edges onto strips of iron 1x¼" and mounted on a wooden frame work of 2x2" uprights and 3x⅞" strips. Tank "A" is 48" long, 15" wide and 12" deep and is called the reservoir. Tanks "B" and "C" are 25" long, 25" wide and 16" deep with a pitch of 1" for draining. The drain tank "D" is 51" long, 24" wide and 8" deep with a pitch of 1". The entire outfit stands 6½' high. Securely fastened to the bottom of tank "A" is a galvanized iron box 12x12x6" in which a small alcohol lamp is placed which on cold mornings is used to remove the chill from the oil. The oil is poured into tank "D" and is pumped into the reservoir, "A," by the hand pump "H. I." Tank "B" is filled with soles stood on end between the meshes of a wire screen or rack, each tank holding 150 pairs. A 2" molasses gate, "G", in the bottom of "A" is opened and the Re-lyt flows into "B" until the soles are covered. These are allowed to stand about an hour when plug "E" is removed and the oil flows into tank "C"", which has previously been filled with soles. At the same time the soles in tank "B" drain and are not removed until dry. When the soles in tank "C" have been treated the plug is removed and the oil drains into "D" when it is pumped back to "A", the pump taking about two quarts at a stroke. Another feature of this process is that, where the other compounds required experienced operators, this can be operated by inexperienced men or boys. Re-lyt being a non-volatile liquid, it is not necessary to drain the tanks when the process is finished and no little expense is saved in this way.

The manufacturers of Re-lyt claim to have a large number of

orders on hand; the writer has seen the process being used in many of the New England factories and has been impressed by its safety and simplicity.

DWIGHT SLEEPER, *Inspector,*
The Underwriters' Bureau of New England.

A NEW ACETYLENE GAS LAMP.

The writer chanced to see the lamp he is about to describe being sold on the streets of New York by one of the many peddlers who are always selling something new. While the lamp is of no practical use there were probably a large number sold as the price was only five cents and four were sold in ten minutes while the writer was watching. The peddler said you could read your paper by them, etc.

The lamp and generator are very simple, consisting of a piece of glass tubing three-eighths of an inch in diameter and about two and a quarter inches long, a cork, a piece of wire and a piece of tin one inch in diameter. The glass tube is drawn to a point at one end and bent over so that it points nearly at right angles to the tube and the lower end is flared out slightly to finish it. One end of the piece of wire is wound tightly around the glass tube and the other end is bent to form a hook or handle. There is a hole in the centre of the tin plate so that you can slip it over the wire handle to act as a reflector. You are also furnished with a round tin box one and a quarter inches in diameter and three-eighths of an inch deep containing calcium carbide. The whole outfit is put up in a pasteboard box one inch by one and three-quarters inches by two and a half inches.

The operating of it is very simple—you place a piece of cotton saturated with water about half way up the tube and then put in your carbide and cork up the bottom. The gas is at once generated and comes out of the fine tube at the top where it is lighted and burned. By using enough carbide and water you can get a flame about three quarters of an inch long. This will burn for only a minute or two and gradually dies down. I have experimented some with it and find that I usually get only a very short flame.

The hazard of this article lies first in the general distribution of calcium carbide among persons entirely ignorant of its dangers. Second the lamp is very unsteady and liable to tip over. Third the bottom part of the glass becomes very hot owing to the heat given off by the generation of the gas. Fourth if the gas is generated too rapidly it will blow out the flame. Fifth if the small tube gets stopped up the cork will blow out, the carbide be spilled and the gas escape. Numbers four and five happened to me during my experiments. Owing to the small amount of carbide used, the danger from the use of these lamps may not be great, but it shows how new and potentially dangerous things are constantly being offered to the public who are entirely ignorant of their dangers.

GEORGE G. HOPKINS, JR., *Inspector,*
New York Board of Fire Underwriters.

ACETYLENE GAS TOY CANNON.

One of the latest toys which is apparently dangerous to be advertised for use is an acetylene gas cannon, which it is announced can be operated by an acetylene air mixture obtained from a small carbide generator supplied with the apparatus. An electric ignition model is advertised complete, post-paid, for $2.50. A dollar can be saved by doing away with the electric ignition and using a flint-lock in its place. Carbide can be purchased at any bicycle supply store, a hammer can be used to break it up, and many thousands of shots are reported to be obtainable by using one can of carbide.

Under certain conditions the manufacturer admits that a flame may strike one's face and singe the eyebrows and eyelashes, and there being no time to wink dust may be blown into the eyes. Also, under a certain combination of circumstances, a bump on the head is recognized as not impossible.

The members of the National Fire Protection Association will very likely prefer that their children and others shall not be supplied with a toy of this character.

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SEATTLE—345 Central Building,
MINNEAPOLIS—716 Lumber Exchange,
NEW ORLEANS—920 Hennen Building,
PITTSBURG—609 Keystone Building.
SAN FRANCISCO—624 Merchants Exchange,

Niagara Fire Extinguisher Co.

Executive Offices and Works

AKRON, OHIO.

ENGINEERS, CONTRACTORS, MANUFACTURERS.

HIGHEST STANDARD

Automatic

Sprinkler

EQUIPMENTS.

Estimates and proposals furnished on application.

The Standard Automatic Sprinkler Company, Ltd.

MONTREAL

AGENTS FOR CANADA.

ROCKWOOD
AUTOMATIC SPRINKLERS

APPROVED BY ALL INSURANCE COMPANIES

INSTALLED BY

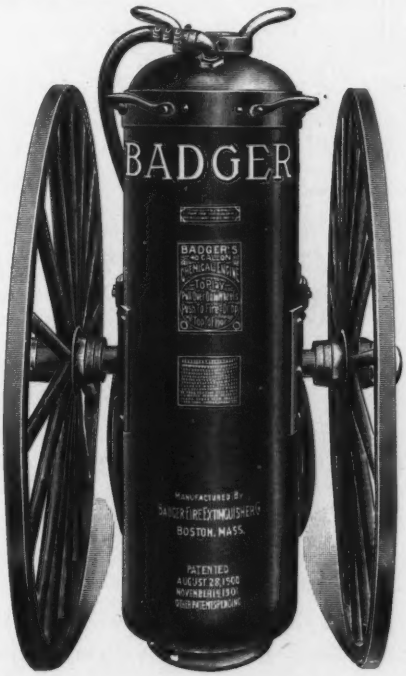
WORCESTER FIRE EXTINGUISHER COMPANY

2 ARCH STREET
WORCESTER, MASS.

2 RECTOR STREET
NEW YORK, N. Y.

BADGER'S
40 GALLON CHEMICAL ENGINE

Included in the list of chemical extinguishers examined under the standard requirements of the National Board of Fire Underwriters by the National Fire Protection Association after exhaustive tests by the Underwriters' Laboratories and approved for use.



ALSO **BADGER'S**

3 GALLON HAND CHEMICAL FIRE EXTINGUISHER

Tested and labeled under the direction of the Underwriters' Laboratories, (Inc.)

Manufactured by

BADGER FIRE EXTINGUISHER CO.

32 PORTLAND STREET - BOSTON, MASS., U. S. A.

NIEDNER'S
LINEN FIRE HOSE

Approved by the
National Fire Protection Association

¶ Our linen hose is Manufactured under the Label Service of the Underwriters' Laboratories and has no superior for inside hose protection.

Manufactured by

CHAS. NIEDNER'S SONS CO.

10-20 JAMES ST. - - MALDEN, MASS.

Trade Mark

EUREKA
FIRE HOSE

Is acknowledged to be the BEST for all fire protection purposes.

¶We are the originators and sole manufacturers of the celebrated brands of seamless woven cotton, mildew proof and rubber-lined fire hose.

EUREKA 4 Ply — **PARAGON** 3 Ply — **RED CROSS** 2 Ply

RUBBER-LINED COTTON FIRE HOSE
For Fire Department, Factory and Mill protection.

HOSE OF EVERY DESCRIPTION.

Send for copy of Catalogue, and Samples

EUREKA FIRE HOSE MFG. CO.
13 BARCLAY STREET, NEW YORK

RUBEROID ROOFING
REG. IN U.S. PAT. OFF.

Approved by the National Fire Protection Association and Fire Departments generally.

A PERFECT PREPARED ROOFING

Contains no Tar, Rubber or Paper. Will not Crack, Rot, Melt or Corrode.

BURNING BRANDS WILL NOT IGNITE IT

Rated same as standard composition roofs—gravel, slag, etc.
Suitable for all buildings.

THE STANDARD PAINT CO.,—100 William St., New York.

Chicago St. Louis Kansas City Boston Philadelphia New Orleans

Carey's Magnesia Flexible Cement Roofing

"Famous for Durability."

The component parts of Carey's roofing, which are compressed into a solid, compact and absolutely waterproof single sheet of Roofing.

CAREY'S is unlike any other roofing—better than any other. Imitators can't duplicate it because the Asphalt Cement Composition used in Carey's Roofing undergoes a secret process. Furthermore, the method of constructing Carey's Roofing is protected by United States patents. :

Write for a sample and free booklet, which explains WHY *Carey's Roofing*—

IS FIRE RESISTING

Does not melt, rot, rust, dry out or lose its life or elasticity; Is proof against heat or cold; Is equally adapted to flat or steep surfaces; Never blows off; May be applied *over* leaky shingles or metal roofs without expense of removal; Is easily laid by common labor; Makes excellent siding; And finally, *WHY Carey's Roofing is the most economical on the market.* : : : : : : : : : : : : :

We take contracts to furnish and apply our roofing anywhere.

THE PHILIP CAREY COMPANY

Sole Distributors

CINCINNATI, OHIO.

Over 40 Branches

THE NEWMAN

PORTABLE WATCHMAN'S WATCH SYSTEM

The FIRST Portable System to receive the Approval of the National Board of Underwriters.

Keys that cannot be duplicated. Rust-proof and non-corrosive.

"THE ONLY TAMPER-PROOF SYSTEM."

NEWMAN CLOCK COMPANY

Specialists Time Recording Devices

CHICAGO—1526 Wabash Avenue

NEW YORK—178 Fulton Street

HAND CHEMICAL EXTINGUISHER
TESTED UNDER SUPERVISION OF
UNDERWRITERS' LABORATORIES, INC.
NO 1100

FIRE EXTINGUISHERS
MADE ON HONOR
"CHILDS"
SOLD ON MERIT.
O. J. CHILDS CO.
UTICA, N.Y.

Approved Feb. 15, '02
and included in the List of Approved Chemical Extinguishers Issued by the National Board of Fire Underwriters.

TESTED AND LABELED
under the direction of the Underwriters' Laboratories.

O. J. CHILDS COMPANY
SOLE MANUFACTURERS
UTICA, NEW YORK, U. S. A.

E. O. HAUSBURG
45 MAIDEN LANE, NEW YORK

The closed case has the paper recording dial only.

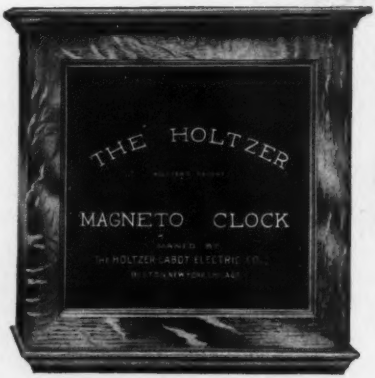
We can furnish these clocks with open or closed case.

Manufacturer of the Celebrated
STANDARD 1904
PORTABLE WATCHMAN'S CLOCK
Approved by the National Fire Protection Association
Also Mfr of Electric and all kinds of Watchman's Clocks

PRICE FROM $12.00 UP
SEND FOR CATALOGUE

THE HOLTZER MAGNETO CLOCK

5 STYLES

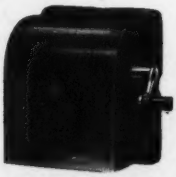


EVERY HOLTZER MAGNETO CLOCK IS GUARANTEED *for a Period of* FIVE YEARS

SUPERIOR POINTS

Requires absolutely no battery
Never fails to make a record
Shows the exact time the door is opened or closed
Has punctured records which are indelible
Its records cannot be falsified
It has substantial mechanism
It has separate magnets for every station
Equipped with accurate, high grade clock
Quartered oak cases, finely finished
Either 12- or 24-hour dials

Send for our Bulletin 152Q



MAGNETO STATION
Weather-proof Pattern

THE HOLTZER-CABOT ELECTRIC CO.
BOSTON (BROOKLINE) MASS.
Western Branch, CHICAGO, ILL.

ESTABLISHED 1848

WITT & BROWN

MANUFACTURERS OF

Metal Window Frames and Sash

GLAZED WITH WIRE GLASS

Manufactured under Supervision of Underwriters Laboratories bearing their labels.

Also Manufacturers of

Cornices and Skylights

All Kinds of Roofing

NO. 215 WEST 3RD STREET

CINCINNATI, OHIO

Fire-proof Metal, Wire Glass Window.

Fire Side Before Test.

Fire Side After Test at Maximum Temperature at 1850°.

Our Windows Contain 65% to 75% Glass Surface (the same as wood windows) which is 10% to 20% more glass than any other metal window in the market.

MESKER AND BROTHER
ST. LOUIS, MISSOURI

SHEET METAL FIRE-PROOF WINDOWS
CARRYING WIRE GLASS

All our types of windows are made according to the specifications and approved by the Fire Underwriters.

75 Per Cent. GLASS SURFACE

Temperature Attained in Tests above 1800 Degrees.

Before (Fire Side). After (Fire Side).

¶ The above are true fac-similes of photos taken before and after the fire test. ¶ Our Windows required but one test to convince and satisfy The Chicago Laboratories as to their efficiency as a fire retardant.
Write for pamphlet entitled "A STORY OF THE LABEL."

CONSOLIDATED SHEET METAL WORKS
FIRE DOORS AND GENERAL SHEET METAL CONTRACTORS
MILWAUKEE, WISCONSIN

EHRET'S SLAG ROOFING

The Standard for Industrial and Manufacturing Plants---and buildings of all kinds in any part of the country---and guaranteed for ten years

Approved by the NATIONAL FIRE UNDERWRITERS and classed by them among the best Fire Retardants

Applied only by

WARREN-EHRET COMPANY
(Established 1852)
PHILADELPHIA

NEW YORK PITTSBURGH BALTIMORE
SCRANTON CHARLOTTE TRENTON

TIN CLAD FIRE DOORS and SHUTTERS

All kinds of Fire Door and Shutter

Hardware and Heat Closing Devices

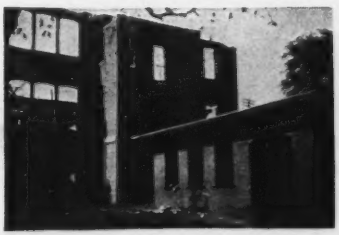
Approved by the
NATIONAL BOARD *of* FIRE UNDERWRITERS

Inspected and labeled by the
UNDERWRITERS' LABORATORIES, INC.

Made by
VICTOR MANUFACTURING CO.
NEWBURYPORT, MASS.

A Remarkable Fire Test of REX FLINTKOTE ROOFING

¶ In the background is a school building in Paris, Texas, recently gutted by fire. The small building in the foreground is covered with Rex Flintkote Roofing. For several hours it was impossible to approach the small building on account of sparks and heat. When the fire was out it was found that the Rex Flintkote roof was uninjured. It is on actual tests like this, that we base our claim that Rex Flintkote Roofing is a thoroughly safe and reliable fire retardent. Rex Flintkote is endorsed by many boards of underwriters.



J. A. & W. BIRD & COMPANY
34 INDIA STREET, BOSTON

Made by
The Tea Tray Company of Newark, N. J.
U. S. A.
FOUNDED 1867